

**Dover Municipal Landfill Superfund Site  
Second Consent Decree for RD/RA**

Civil Action No. 1:92-cv-406-M

**APPENDIX B**

**2007 SOW**

## **Appendix B**

### **U.S. ENVIRONMENTAL PROTECTION AGENCY REGION 1**

#### **Remedial Design / Remedial Action Statement of Work to the Amended Consent Decree ("2007 SOW")**

#### **Dover Municipal Landfill Superfund Site Dover, New Hampshire**

**2007**

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Statement of Work for Remedial Design, Remedial Action, and Operation and Maintenance

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# Dover Municipal Landfill Superfund Site Remedial Design/Remedial Action Statement of Work 2007

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**LIST OF ACRONYMS**

This is a list of acronyms in general use and does not include acronyms for specific deliverables that are mandated by this Statement of Work. Acronyms for specific documents are explained and delineated in Attachment.

1991 ROD - Record of Decision issued by EPA in September 1991.  
1993 Consent Decree - Consent Decree entered by the Court on July 23, 1993.  
1993 SOW - Statement of Work that accompanied the 1993 Consent Decree.  
2004 AROD - Amended Record of Decision issued by EPA in September 2004.  
2007 ACD - Amended Consent Decree of which is this Statement of Work is an appendix.  
2007 SOW - This Statement of Work.  
ARARs - Applicable or Relevant and Appropriate Requirements..  
Amended Consent Decree - Document that this 2007 SOW is attached to as Appendix B.  
CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended.  
CFR - Code of Federal Regulations.  
CQAPP - Construction Quality Assurance/Quality Control Plans.  
EMP - Environmental Monitoring Program.  
EPA - Environmental Protection Agency.  
GMZ - Ground Water Management Zone.  
ICLs - Interim Cleanup Levels.  
MNA - Monitored Natural Attenuation.  
NCP - National Contingency Plan.  
NHDES - New Hampshire Department of Environmental Services.  
O&F - Operational and Functional.  
O&M - Operations and Maintenance.  
PDI - Pre-Design Investigation.  
POP - Project Operations Plan.  
POTW - Publicly-owned Treatment Works.  
RCRA - Resource Conservation and Recovery Act.  
RD/RA - Remedial Design/Remedial Action.  
RFFS - Revised Focused Feasibility Study.  
THF - Tetrahydrofuran.  
VOC - Volatile Organic Compound.  
WMA - Waste Management Area.  
WP - Work Plan.

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**Appendix B: Dover Municipal Landfill  
Revised Draft Remedial Design / Remedial Action Statement of Work  
2007**

**1. INTRODUCTION AND PURPOSE**

This Remedial Design/Remedial Action Statement of Work (the “2007 SOW”) further defines the activities and deliverables to be performed by the Work Settling Defendants for Remedial Design/Remedial Action (“RD/RA”) activities and Operation and Maintenance (“O&M”) under the Amended Consent Decree, Civil Action No. 1:92-CV-406-N (the “Amended Consent Decree”), to be lodged with this 2007 SOW in the U.S. District Court for the District of New Hampshire, and pursuant to the 2004 Amended Record of Decision (the “2004 AROD”) and the appropriate portions of the 1991 Record of Decision (the “1991 ROD”) for the Dover Municipal Landfill Superfund Site, issued by the United States Environmental Protection Agency (“EPA”).

EPA, the State of New Hampshire Department of Environmental Services (“NHDES”), and the Work Settling Defendants signed a Consent Decree, which was entered by the Court on July 23, 1993 (the “1993 Consent Decree”), agreeing to perform the work set forth in the Statement of Work (the “1993 SOW”) that was attached as Appendix B to the 1993 Consent Decree (the 1993 SOW is currently attached to the Amended Consent Decree as Appendix B-1). The Source Control landfill cap portion of the 1991 ROD remedy was designed for the Site; however, investigations during and following that design demonstrated that an alternate Source Control remedy could be as effective or even superior to the cap. Following a Revised Focused Feasibility Study (the “RFFS”) proposed by the Work Settling Defendants and EPA’s Addendum to the RFFS, EPA issued the 2004 AROD revising the Source Control component of the 1991 ROD on September 30, 2004.

This 2007 SOW supersedes the 1993 SOW that was attached to the 1993 Consent Decree as Appendix B; however, the following sections of the 1993 SOW are incorporated into this 2007 SOW, as amended by the 2004 AROD and Amended Consent Decree, and as may be modified by the provisions and requirements within this 2007 SOW:

Section C - *Overview of Remedy for Consolidation of Sediments in the Drainage Swale*, excepting disposal of sediments under the landfill cap, those sediments shall be disposed of off-site.

Section E - *Overview of Remedy for Treating Contaminated Groundwater*, specifically the relevant portions of Sections E.2. and E.3., *Technology for Restoring Groundwater* and *Standards for Contaminated Groundwater Collection/Extraction and Treatment System*, respectively.

Section F - *Administrative Review of Certain Performance Standards*, the entire section applies with the exception of those elements amended by the 2004 AROD.

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Section J (listed as Section I in the text) - *Institutional Controls*, the entire section applies.

Attachment 4 - *Construction Quality Assurance/Quality Control Plans* ("CQAPPs"), this attachment is retained and shall be performed for each remedial action performed at the Site regardless of whether or not a contingency remedy is invoked.

Additionally, if a contingent remedy is required to be performed as outlined in Section 9.1 herein, the following sections of the 1993 SOW are also incorporated into the 2007 SOW:

Section D - *Overview of Remedy for Capping the Landfill*, the entire section applies as presented in the draft 100% design of the 1991 ROD remedy and as required by any updates as outlined by this 2007 SOW. EPA held in abeyance approval of the 1996 Draft 100% Source Control Remedial Design based on the potential changes that may occur over the life of the pilot study. Therefore, implementation of the contingent Source Control remedy would require an updating of the 1996 Draft 100% Design prior to implementation.

Section E - *Overview of Remedy for Treating GroundWater*, for those portions applying to the landfill cap and groundwater/leachate collection/extraction and treatment system as presented in the draft 100% design of the 1991 ROD remedy and as required by any updates as outlined by this 2007 SOW.

Section G - *Remedial Design*, the entire section applies with the exception of those items completed through previous work or which are precluded by the 2004 AROD.

Section H - *Remedial Action*, the entire section applies to implementation of the draft 100% design of the 1991 ROD remedy and as required by any updates as outlined by this SOW.

Section I - *Long-Term Operation and Maintenance*, the entire section applies to implementation of the draft 100% design of the 1991 ROD remedy and as required by any updates as outlined by this 2007 SOW.

Attachment 2 - *Dover Municipal Landfill Waste Management Area and Groundwater Extraction System Capture Zone* is retained for use with the Source Control contingent remedy.

The Work Settling Defendants shall perform all Pre-Design Investigations ("PDIs"), RD/RA and O&M activities set forth in the 2007 SOW unless otherwise specified by EPA. To the extent that there are conflicts between the 2007 SOW and applicable provisions of CERCLA or the NCP, CERCLA or the NCP shall control. Final Work Plans, approved or modified by EPA, after reasonable opportunity for review and comment by NHDES, will be deemed to address the requirements of the 2007 SOW and will be the controlling documents governing project

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activities, deliverables, and schedules implemented pursuant to the Amended Consent Decree and the 2007 SOW.

## **2. DEFINITIONS AND CONVENTION**

In addition to those definitions contained in the Amended Consent Decree the following definitions shall apply to this 2007 SOW:

**2.1 “Constituents of Concern” or “COCs”** shall mean the contaminants listed in Table 11 of the Amended Record of Decision issued in September 2004, i.e., arsenic, vinyl chloride, benzene, trichloroethene, tetrachloroethene, methylene chloride, 1,1-dichloroethene, 1,2-dichloroethane, cis-1,2-dichloroethene, chloroethane, tetrahydrofuran, acetone, methyl ethyl ketone (MEK), methyl isobutyl ketone (MIBK), and toluene.

**2.2 “Contingent Remedy”** shall mean those remedies conducted to attain performance standards if EPA determines that the remedial action for either the Source Control or Management of Migration for the Eastern Plume as defined in the 2004 AROD have failed. The contingent remedies for the Source Control and Eastern Plume Management of Migration are described in Sections 3, 6, 8 and 9 of this 2007 SOW.

**2.3 “Design” or “Remedial Design”** shall mean an identification of the technology and its performance and operational specifications, in accordance with all applicable federal, state, and local laws, including, but not limited to:

2.3.1. All computations used to size units, determine the appropriateness of technologies, and the projected effectiveness of the system.

2.3.2. Materials handling and system layouts for any excavation and treatment of soils, if required; the extraction and treatment of ground water, or in-situ treatment of soil and ground water, if required; and the decontamination and demolition of facilities including size and location of units, treatment rates, location of electrical equipment and pipelines, and treatment of effluent discharge areas.

2.3.3. Scale drawings of all system layouts identified above and including, but not limited to, excavation cross-sections, well logs and geologic cross-sections.

2.3.4. Quantitative analysis demonstrating the anticipated effectiveness of the Remedial Design to achieve the Performance Standards.

2.3.5. Technical specifications which detail the following:

2.3.5.1. Size and type of each major component.

2.3.5.2. Required performance criteria of each major component.

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2.3.6. Description of the extent of ambient air monitoring needed including equipment, monitoring locations, and data handling procedures; and

2.3.7. Description of access, land easements and/or other institutional controls required, to be supplied with the construction plans and specifications.

**2.4 “Drainage Swale”** or the “Swale” shall mean the waterway that begins at Tolend Road (where the Southern and Northern Perimeter Ditches separately discharge) and flows northward to the Cocheco River. The Drainage Swale is shown on Figure 2, herein.

**2.5 “Eastern Plume”** shall have the same meaning as in the 1993 Consent Decree and is also shown schematically on Figure 2, herein. The Eastern Plume is defined as the contaminated ground water which flows towards and discharges to the Cocheco River, and not contaminated ground water that flows towards the Bellamy Reservoir.

**2.6 “Groundwater Management Zone”** or the “GMZ” is an area defined by the extent of ground water contamination pursuant to State of New Hampshire Administrative Rule Env-Or 602.13, as amended. For purposes of this 2007 SOW, the GMZ will include the subsurface volume in which ground water associated with the landfill contains constituent concentrations that exceed ICLs.

**2.7 “Interim Cleanup Levels”** or “ICLs” are target cleanup levels for the COCs identified in Table 11 of the Amended Record of Decision issued in September 2004.

**2.8 “Monitored Natural Attenuation”** or “MNA” shall mean the reduction of contaminants in ground water through natural mechanisms in the undisturbed aquifer underlying the Site. MNA will be implemented, operated and evaluated in accordance with *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites* (OSWER Directive 9200.4-17P, April 21, 1999) and other guidance accepted by EPA.

**2.9 “Northern Perimeter Ditch”** referred to as the Northern Drainage Ditch in the 2004 AROD and also referred to as the “Northern Ditch” shall mean the waterway that drains the northwestern and northern edges of the landfill, flowing first northeast and then east. The Northern Ditch enters a subsurface culvert pipe on the west side of Tolend Road, then traverses southeasterly under Tolend Road and discharges to a network of roadside ditches along the north side of the intersection of Tolend and Glen Hill Roads, which discharge through a culvert under Glen Hill Road into the west end of the Drainage Swale. The Northern Ditch is shown on Figure 2, herein.

**2.10 “Performance Standards”** shall mean those cleanup standards, standards of control, cleanup levels, treatment standards, Institutional Controls, and other substantive requirements, criteria or limitations set forth in Section 4 of this 2007 SOW and in Section K of the 2004 AROD.

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**2.11 “Response Action”** shall mean those actions taken to reduce or eliminate risk or to ensure the effectiveness of other remedial components.

**2.12 “Source Area”** shall mean areas of ground water or soil contamination that will, or may have the potential to, cause ground water to migrate outside the Waste Management Area with COCs at concentrations above ICLs.

**2.13 “Southern Perimeter Ditch”** referred to as the Southern Drainage Ditch in the 2004 AROD and also referred to as the “Southern Ditch” shall mean the waterway that runs along the southern and eastern perimeter of the landfill. The Southern Ditch flows eastward and then northward, enters a subsurface pipe beneath Tolend Road and discharges to the Swale. The Southern Ditch is shown on Figure 2, herein.

**2.14 “Southern Plume”** shall have the same meaning as in the 1993 Consent Decree and is also shown on Figure 2, herein.

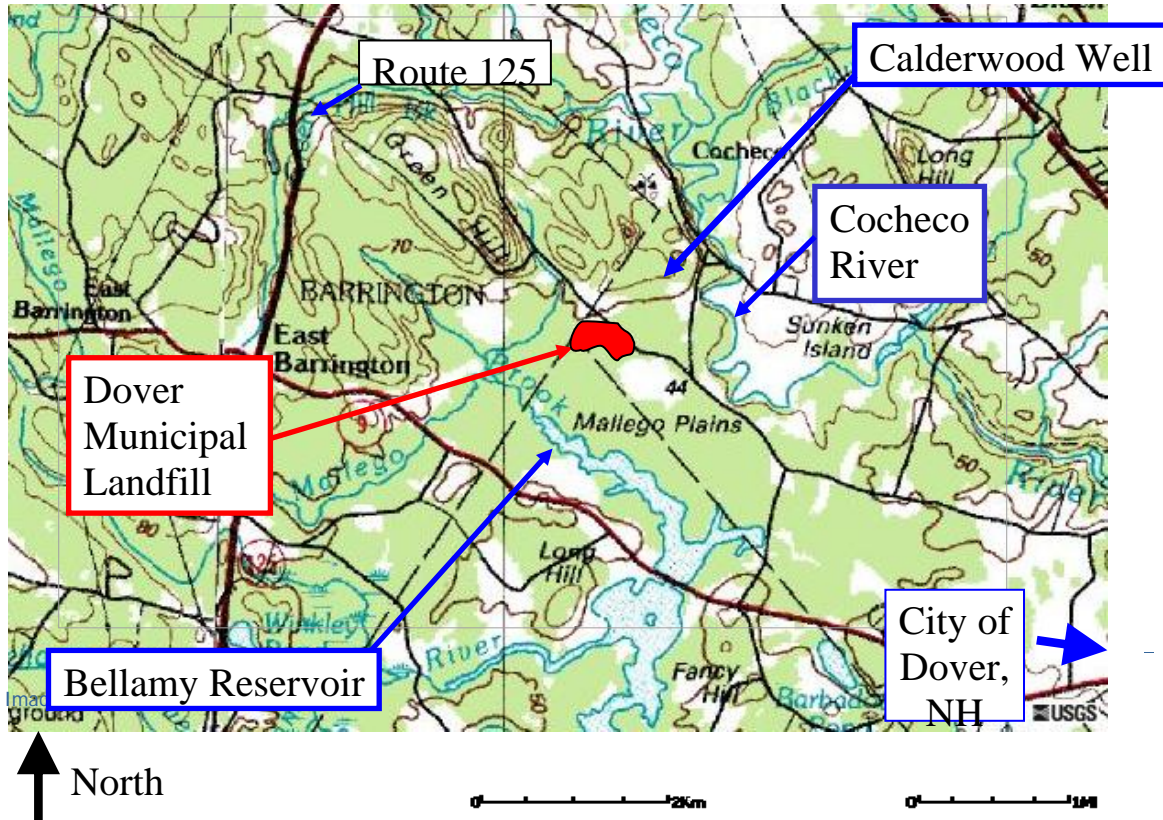
**2.15 “Waste Management Area”** or the “WMA” shall mean both the horizontal limit and that limit projected vertically into the subsurface of the area in which waste still exists at the Site.

**2.16 “Work”** shall mean all activities Work Settling Defendants are required to perform under the Amended Consent Decree, the 2004 AROD, and this 2007 SOW.

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**Figure 1**

Location of Site. The landfill is shown in red at the center of the USGS topographic map. The main features surrounding the site are noted.

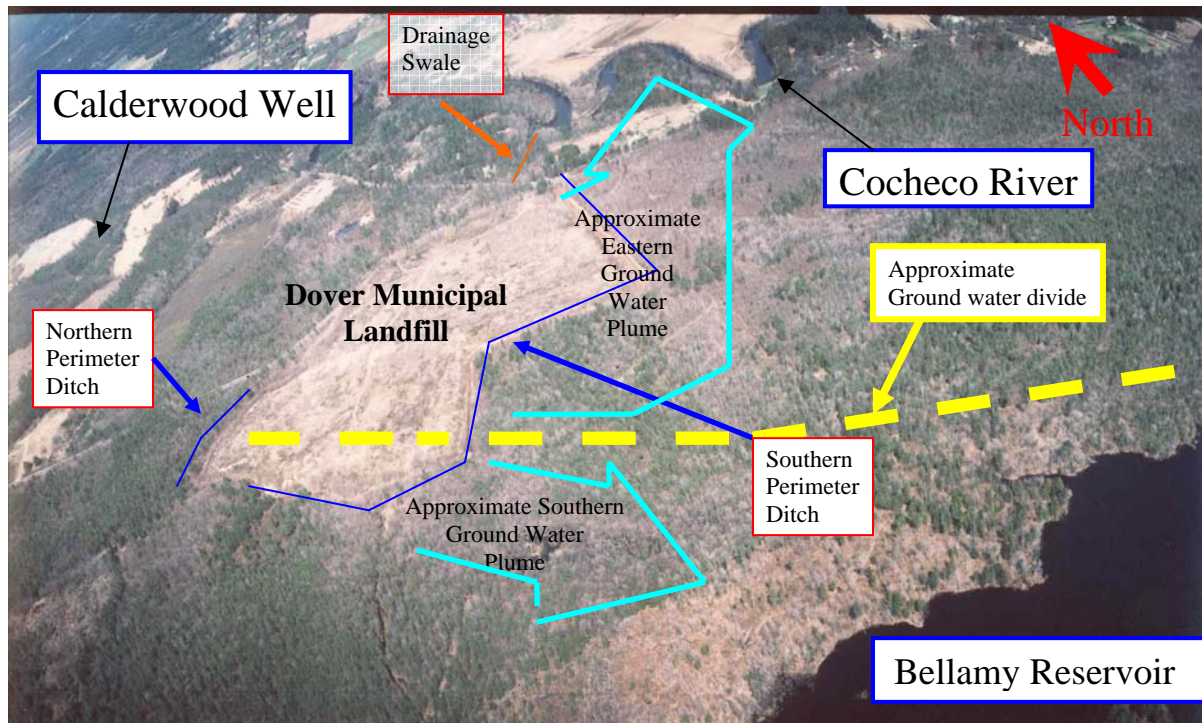


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**Figure 2**

Site Features. The landfill is the light-colored area enclosed by the Northern and Southern Perimeter Ditches. A thin blue line is superimposed over the location of the Northern and Southern Perimeter Ditches for clarity.



EPIC photo, May 7, 1992

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### **3. OVERVIEW OF THE SELECTED REMEDY**

EPA selected the Mixed Alternative in the 2004 AROD as providing the best balance between the nine criteria to restore the impacted ground water, source areas and sediments, and to evaluate potential indoor air risks associated with the Site. Section K.1. in the 2004 AROD describes the activities to be performed with respect to Source Control and Management of Migration, as well as addressing issues such as contaminated sediments and indoor air. Section X of the 1991 ROD further describes the contingent remedies for the Source Control and Eastern Plume Management of Migration components of the 2004 AROD. The designs for the landfill cap were presented in the draft 100% Remedial Design Report completed by Golder & Associates, Inc. ("Golder") in December 1996 and may have to be modified by updates as required by this 2007 SOW.

The 2004 AROD also identified data gaps and set schedules for acquiring information through several PDIs. The schedules for delivery of the results of these PDIs are contained in Section 4.8.8., herein. Below is an overview of the major components of the remedy to be performed by the Work Settling Defendants arranged in the sections where they are discussed in this 2007 SOW.

#### Section 5 - Sampling, Assessment and Remedial Response Action

This section contains several elements that are not readily identified with either the Source Control or Management of Migration Remedies, but are important in managing risk at the Site. Section 5 of this 2007 SOW outlines, in detail, the required tasks with respect to:

- Characterizing sediments in the Southern Perimeter Ditch, Drainage Swale, and the Cocheco River and appropriately managing those sediments that either exceed promulgated standards, or create a human health risk, or impair ecological receptors.
- Characterizing potential human health risks from COCs associated with possible vapor intrusion of volatile organic compounds ("VOCs") into indoor air in residences overlying contaminated ground water, and if necessary, taking actions to reduce any risk.
- Determining the source of high concentrations of COCs detected in surface water in the northwest corner of the landfill.
- Completing a Ground Water Model and a Fate and Transport Model to guide future investigations and remedial efforts.
- Modifying the existing Environmental Monitoring Plan ("EMP") to integrate future remedy monitoring needs, comply with GMZ monitoring requirements, and adapt to changing conditions at the Site as remedial efforts are implemented.

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- Establishing and modifying existing Institutional Controls as necessary to eliminate risk due to contact with COCs in all environmental media and to minimize adverse effects associated with remedial action taken at the Site.

#### Section 6 - Source Control

The 2004 AROD selected an air-sparging trench that will run along the edge of the landfill from the northeast corner, to the western edge. The trench will be constructed to key into the underlying marine clay. The trench will capture target COCs, including volatile organic compounds (“VOCs”) and hydrocarbons, will degrade tetrahydrofuran (“THF”), and will capture arsenic. The air-sparging trench will not allow ground water with COC concentrations above ICLs to leave the WMA and will ultimately allow ground water beneath the landfill to reach interim cleanup levels. Section 6 will discuss the PDIs, and the design and construction phases of the air-sparging trench. This section will also discuss how monitoring and assessment of the air-sparging trench will occur, and how failure will be determined. The contingent remedy required for the air-sparging trench, if EPA determines it has failed, is discussed in Section 9.

#### Section 7 - Southern Plume Management of Migration

This portion of the site remedy is unchanged from the 1991 ROD; however, it is more clearly defined in Section 7 of this 2007 SOW. The Southern Plume Management of Migration remedy will capture or contain ground water with COC concentrations above ICLs migrating towards the Bellamy Reservoir and restore ground water in the Southern Plume through pump-and-treat. Extracted ground water will be treated to remove COCs; treatment will occur either on-site or at the Dover Publicly-Owned Treatment Works (“POTW”). If treatment occurs on-site, the treated ground water will be discharged in the area of the Southern Plume.

#### Section 8 - Eastern Plume Management of Migration

This portion of the site remedy is unchanged from the 1991 ROD, except that the 2004 AROD requires that the plume be monitored and otherwise addressed in accordance with EPA’s guidance for MNA remedies. The Monitored Natural Attenuation (“MNA”) remedy will restore ground water in the Eastern Plume that is currently discharging to the Cocheco River. If EPA determines that MNA will not restore ground water in the Eastern Plume in a reasonable time after the Source Control Remedy is Operational and Functional as described in Section 6.3.7 or that the Eastern Plume creates an unacceptable risk as described in Section 4.1.2, the contingent pump-and-treat remedy shall be implemented. The Eastern Plume contingent remedy is outlined in Section 9 of this document.

### **3. PERFORMANCE STANDARDS**

The Work Settling Defendants shall design, construct, operate, monitor, and maintain the remedy in compliance with all ARARs identified in the 2004 AROD and those ARARs, as appropriate, identified in the 1991 ROD. In addition, the Work Settling Defendants shall secure and maintain

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Institutional Controls on properties inside the GMZ precluding the use of ground water on those properties and prohibiting any activities that EPA determines will either create an exposure to impacted ground water that presents unacceptable risk or that may compromise the performance of either the Source Control or Management of Migration Remedies. At the conclusion of the remedy it is expected that hazardous waste in the landfill will no longer leach COCs into the ground water surrounding and beneath the landfill at concentrations that pose an unacceptable risk to either human health or the environment and that no cross-media contamination will occur.<sup>1</sup> Further activities at the landfill at that time will be subject to State of New Hampshire regulations. The Work Settling Defendants shall also attain the following Performance Standards at the Site:

#### **4.1 Performance Standards for Ground Water Restoration within the GMZ**

The goal of the remedy at the Site is cleanup of ground water impacted by COCs to meet ICLs and, ultimately, to concentrations that do not pose an unacceptable risk to human health and the environment throughout the GMZ and to comply with the USEPA clean closure policy (as also outlined on p. 77 of the 2004 AROD) in the WMA. The GMZ includes contaminated ground water within the waste, in the aquifer beneath the landfill, and in the existing contaminated plumes of ground water in the aquifer surrounding the Site. Interim Cleanup Levels ("ICLs") for ground water contamination are specified by EPA in Table 11 of the 2004 AROD. Although the concentrations in Table 11 of the 2004 AROD are consistent with ARARs, the levels are considered ICLs because the cumulative risk posed by these contaminants, after attainment of each ICL may still exceed EPA's and/or the State's risk management standards. If so, cleanup levels will be revised to ensure protectiveness. The Work Settling Defendants must demonstrate that they have achieved compliance throughout the GMZ according to the evaluation procedure defined in 40 C.F.R. § 264.97 and New Hampshire Rules Env-Or 600, as amended.

##### **4.1.1. Standards for Ground Water Restoration in the Southern Plume**

Ground water in this portion of the Site will be restored by extracting contaminated ground water, treating it to appropriate standards and then discharging that water in compliance with Section 4.5, herein. The ground water extraction and treatment system for the Southern Plume will be operated in a manner that will restore ground water in this portion of the aquifer to contaminant concentrations protective of human health and the environment within a reasonable time, and that will prevent further migration of contaminants exceeding ICLs to the Bellamy Reservoir. Failure to meet these standards, as determined by EPA, may require the performance of additional remedial action activities within the Southern Plume.

Using procedures defined in 40 C.F.R. § 264.97, the Work Settling Defendants shall demonstrate that the ICLs within the Southern Plume have been attained and maintained for a period of one year before requesting that the pump-and-treat system be deactivated. Once the system is

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<sup>1</sup> Risk-Based Clean Closure. USEPA, Elizabeth Cotsworth, Acting Director, Office of Solid Waste, March 16, 1998.

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deactivated, the Work Settling Defendants shall demonstrate through monitoring that the ICLs are being maintained within the Southern Plume until the Site-wide remedial action as described in Section 10 of this SOW, is complete. Once the system is deactivated and before issuance of a Certificate of Completion as described in Section 10.4, routine maintenance of the pump-and-treat system shall occur and system readiness shall be such that it can be re-activated and at full operation within 30 days of notice by EPA. If, at any time, EPA determines that monitoring data indicate ICLs are not being maintained within the Southern Plume, Work Settling Defendants shall resume active ground water pump-and-treat.

#### 4.1.2. Standards for Ground Water Restoration in the Eastern Plume

Ground water in the Eastern Plume exceeds ICLs and is currently discharging to the Cocheco River. The ground water remedy for the Eastern Plume is Monitored Natural Attenuation ("MNA"). If the entire Source Control remedy up-gradient of the Eastern Plume is not Operational and Functional ("O&F") by October 2010, and if EPA determines that the Eastern Plume creates unacceptable current risks to human health or the environment in surface waters or sediments of the Cocheco River, or ground water, it may require that a contingent pump-and-treat remedy be implemented to restore ground water in the Eastern Plume and halt its discharge into the Cocheco River. The success of MNA is dependent upon operation of the Source Control remedy to halt the supply of contaminants from the Waste Management Area to the Eastern Plume. Once a segment of the air-sparging trench is O&F, EPA will assess whether MNA in the Eastern Plume will attain cleanup levels within what EPA determines is a reasonable time frame.

#### 4.2. Performance Standards for the Landfill Cover

The landfill cover shall be maintained as it presently exists with natural vegetation except for designated Work areas described under a Work Plan or other deliverable required by this 2007 SOW. Success of the Source Control remedy depends on uninterrupted flushing through the waste material. The landfill cover shall be maintained to allow infiltration of precipitation to flow through the wastes, mobilizing COCs and conveying them to the air-sparging trench. Any designated Work areas shall be repaired with natural soils, stabilized by an inert material, and allowed to naturally re-vegetate if the Work in that area is finished or if no Work is proposed in that area for more than 3 months. Direct contact with solid or hazardous wastes in the landfill is to be prevented and exposures of such materials shall be promptly corrected. Results of previous air monitoring performed on top of the landfill indicated that air quality did not pose a risk to human health; accordingly, to ensure that persistent, unacceptable inhalation risks do not occur, air monitoring will be performed if the cover is disturbed by excavation and after the cover is replaced following closure of the excavation. Areas of erosion or where a lack of organic material prevents vegetative growth will be patched with soil and seeded with annual grass seed or covered by an erosion control mat sufficient to allow native vegetation to re-vegetate the disturbed surface. Invasive species will not be introduced in maintaining the landfill cover or in restoring areas disturbed by PDI and remedial action activities. To the extent practicable, invasive plant species encountered on, or in close proximity to the landfill, during construction or maintenance activities shall be removed from the areas within which construction or maintenance activities occur. If the contingent Source Control remedy (i.e., the landfill cap in

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the 1991 ROD) is implemented, the Performance Standards in Section D.1. of the 1993 SOW shall apply.

#### **4.3 Performance Standards for the Air Sparging Trench and Ground Water in the Air-Sparging Trench**

For each segment of the air-sparging trench, interim cleanup levels ("ICLs") for all COCs will be met in all ground water exiting the trench. The air-sparging trench shall be maintained to intercept and treat all ground water with concentrations of COCs above ICLs emanating from the WMA and comply with the criteria in Section 6. The methods to determine and meet this standard are also explained in Section 6.

The precipitation of inorganic compounds or organic growths in the air-sparging trench and within the adjoining aquifer shall be monitored during conduct of the remedy and assessed at the conclusion of the remedy. Within the air-sparging trench, the goal is to determine the effectiveness of the remedy to treat or immobilize contaminants. Up-gradient and down-gradient of the air-sparging trench, the goal is to ensure that arsenic precipitates are not formed that will cause ICLs to be exceeded in the ground water in the future under expected post-remedy conditions.

During the performance of the remedy, the air sparging trench shall maintain hydraulic conductivity sufficient to capture, immobilize or destroy all COCs. To determine if potential clogging of the air-sparging trench is occurring, hydraulic conductivity will be monitored. If EPA determines that the trench is not treating contaminants sufficiently due to clogging of the trench materials or adjacent native soils, it may direct that the porous media in the air-sparging trench be excavated or that operational hydraulic conductivity be restored by other technologies proposed by the Work Settling Defendants and approved by EPA.

During performance of the remedy, monitoring of ground water geochemistry up-gradient and down-gradient of the air-sparging trench will be performed. The objective will be to evaluate redox conditions that affect precipitation of iron and arsenic-containing phases that may result in clogging of native aquifer materials up-gradient and down-gradient of the trench. Testing of aquifer solids may also be performed to support this evaluation. The standard is that arsenic-containing materials will not be allowed to precipitate in the adjacent native soils or aquifer matrix at concentrations that adversely affect performance of the air-sparging trench and that, when exposed to expected post-remedy environmental conditions, EPA determines may solubilize in aqueous concentrations that exceed ICLs for arsenic.

#### **4.4 Performance Standards for the Excavation of Sediments**

Ground water containing arsenic and iron discharges to the Northern and Southern Perimeter Ditches, the Drainage Swale, and the Cocheco River. On exposure to oxidizing conditions, arsenic and iron generally precipitate and form metalliferous sediments. Sediments containing predominantly arsenic and iron are located in the Northern and Southern Perimeter Ditches and Drainage Swale as well as in localized areas along the west bank of the Cocheco River down-

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gradient of the landfill. Figure 2 displays the location of the Perimeter Ditches and Drainage Swale as well as the Cocheco River.

In conducting the excavation of sediments, the Work Settling Defendants shall take every measure practicable to avoid adverse impact on and disturbance to wetland and floodplain areas and the Cocheco River; Work Settling Defendants shall also minimize adverse impact to the flora and fauna in these areas to the maximum extent practicable. In performing the excavation, Work Settling Defendants shall use appropriate engineering controls such as coffer dams, silt barriers and/or straw bales, and erosion control matting to prevent erosion or isolate the sediments and to minimize suspension and downstream transport of these materials. Following completion of the sediment excavation, the Work Settling Defendants shall restore wetlands and floodplains adversely affected by the Work to a condition similar to that of the immediately adjacent undisturbed wetlands or floodplains.

The Work Settling Defendants shall conduct all activities involving the wetlands and floodplains in a manner consistent with Executive Orders 11990 and 11988, and 40 C.F.R. Part 6, Appendix A. The Work Settling Defendants shall conduct all activities in the wetlands and floodplains in a manner utilizing the best practicable alternative that will have the least adverse impact on the aquatic ecosystem and the environment, consistent with and pursuant to all ARARs identified in Appendix A of the 2004 AROD.

The Work Settling Defendants shall test the soils/sediments remaining after excavation by analyzing representative samples of those soils/sediments as outlined in Section 5.1.3., herein.

4.4.1. In compliance with the 1991 ROD, sediments in the Perimeter Ditches and Drainage Swale above the 50 ppm arsenic cleanup level will be excavated and disposed of at an approved off-site facility. Portions of the Perimeter Ditches surrounding the landfill may be excavated and backfilled as part of the Source Control Remedy; therefore no future monitoring of sediments is required for those segments. However, portions of the Perimeter Ditches and Drainage Swale that are not back-filled may still accumulate arsenic-contaminated sediments; therefore, periodic monitoring of those sediments will be required. Should sediment with concentrations exceeding the 50 ppm arsenic cleanup level become re-deposited, they shall be excavated and disposed of at an approved off-site facility. In those areas where wetlands are disturbed by remedial actions, the Work Settling Defendants shall map the extent of the disturbance and provide appropriate mitigation within that watershed, including, if appropriate and practicable, in-place restoration.

4.4.2. Cocheco River sediments will be assessed during the Sediment PDI. Thereafter, sediments at the locations sampled during the Sediment PDI and at the confluence of the erosional swale located southeast of the B-9 well cluster with the river, shall be sampled annually by the Work Settling Defendants until three sets of sediment data, including those obtained during the Sediment PDI have been collected. At the end of the three year period, EPA will evaluate the results with respect to human health and ecological risk. If EPA determines from this risk evaluation that annual sediment sampling is no longer necessary, then sediment sampling shall occur at five-years intervals to support 5-Year Reviews required at the Site. If EPA determines from this risk evaluation that sediments that pose an unacceptable risk to human

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health or the environment, then EPA will determine the proper action to be taken by the Work Settling Defendants to minimize or eliminate that risk.

#### **4.5 Performance Standards for Discharges of Treated Ground Water**

Ground water, after extraction from beneath the landfill or from the aquifers surrounding the landfill, shall be treated to standards appropriate to the media to which it will be discharged. If discharge is to surface waters, the treated water shall meet all Federal and State of New Hampshire surface water discharge standards. If discharge is to a Publicly-Owned Treatment Works ("POTW"), the discharge shall meet the pre-treatment requirements of that POTW.

#### **4.6 Performance Standards for Emissions to Air**

Air discharges from any remedial actions and/or treatment processes at the Site shall meet all Federal and State of New Hampshire ARARs for air emissions. Indoor air concentrations of COCs originating from site ground water into structures overlying the Eastern Plume shall not pose an unacceptable risk to inhabitants.

#### **4.7 Performance Standards for Institutional Controls and Access Restrictions**

A GMZ shall be proposed and established prior to the source control or extended plume remedies becoming O&F then monitored during active treatment to ensure compliance with State Groundwater Management Permit Rule Env-Or 607, as amended. Institutional controls shall be established restricting the use of ground water for any purpose inside the GMZ and restricting activities on or near the landfill until the ground water at the Site is restored to meet Performance Standards as set forth in Section 4.1. of this SOW. These restricted uses and activities include the installation and operation of any wells and excavation into the water table or waste materials located within the GMZ. With respect to the landfill surface, an activity and use restriction shall be placed on the WMA, in accordance with Env-Or 608, as amended, that prohibits activities on the landfill surface that may create a human health or environmental risk or that may negatively affect the Source Control or Management of Migration remedies, until the cleanup is complete. The Work Settling Defendants shall notify the public through signage and public notice of areas where EPA determines that exposure to sediment or surface water may pose an unacceptable risk to the public through activities performed pursuant to Section 4.4.2. of this SOW.

With respect to the ground water institutional controls, as long as Dover and Madbury maintain in effect municipal ordinances prohibiting the use of ground water in the GMZ or equivalent protections, and as long as the Groundwater Management Permit issued pursuant to the requirements of State Groundwater Management Permit Rule Env-Or 607 (which became effective on February 1, 2007) or equivalent rules remains in effect, EPA will not require the execution and recordation of easements on properties where public water supply is available and which are owned or controlled by persons other than any of the Settling Defendants.

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#### **4.8 Deliverables and Submissions**

Below are the general requirements for all Work Plans (“WPs”) required by this 2007 SOW. One critical element of all Work Plans is the Project Operations Plan (“POP”). The POP is comprised of several documents listed in Attachment A. Because some of these documents that form the POP will be identical for all phases of Work, while others may require customization, each Work Plan shall contain the POP documents that are specific to that Work Plan and will reference those POP documents. A critical document contained in the POP is a Quality Assurance Project Plan (“QAPP”). The Work Settling Defendants have submitted, and EPA has approved a QAPP that regulates the data collection at the Site.<sup>2</sup> Investigations or methods not approved under the existing QAPP that are required at the Site will either require an amendment to the existing QAPP or a new QAPP as appropriate. For Work performed pursuant to this 2007 SOW, QAPP(s) that are approved or modified by EPA will be deemed to comply with the provisions of Paragraph 23 of the Amended Consent Decree.

4.8.1. Work Plans and all other deliverables shall be submitted to EPA and the State in accordance with Section XI of the Amended Consent Decree for any Work conducted under the Amended Consent Decree. The Work Plans shall discuss the techniques, methods, and results expected under each investigation or for the Work to be conducted. Each Work Plan shall contain a detailed description of all activities to be undertaken in connection with each investigation or Work to be conducted. The detailed descriptions shall contain a statement of purpose and objectives, identification of the specific activities necessary to complete the task, and a detailed schedule for the performance of the task. The Work Plans shall contain additional details as they bear on that particular task and are explained in each of the sections below. The Work Plans will reference the necessary Project Operations Plan components noted in Section 4.8.2. below, including the Quality Assurance Project Plan (“QAPP”), Site Management Plan (“SMP”), and Health and Safety Plan (“HASP”) and whether those components are present in other Work Plans/POPs or are new and attached to that Work Plan. The Work Plans shall also contain, at a minimum:

4.8.1.1. A description of all activities necessary to implement all components of the task. The described activities must include but are not limited to the following additional information:

4.8.1.1.1. Award of project contracts, including all agreements with off-site treatment and/or disposal facilities.

4.8.1.1.2. Contractor mobilization/Site preparation activities, including construction of necessary support zones, staging areas, utility hookups, and any other necessary facilities.

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<sup>2</sup> EPA has reviewed and approved a QAPP dated March 30, 2005 covering investigations currently underway.

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4.8.1.1.3. The location of construction, work areas, as well as a description of transportation routes, and any necessary material and equipment. The description shall designate work areas and describe how construction in those areas will comply with ARARs and substantive regulations.

4.8.1.1.4. Sample collection, preservation, management, and analysis procedures for all media that will be tested or monitored in conjunction with PDIs or remedial action.

4.8.1.1.5. The methods of construction, shake-down, and start up of any remediation systems.

4.8.1.1.6. The methods of demobilization of all treatment facilities, wells, work areas, or investigation residuals upon completion of the Work or investigations. This description shall also describe how the areas altered by the Work will be restored to pre-work conditions.

4.8.1.2. A detailed schedule for the completion of all activities, including the required deliverables, and an identification of milestone events in the performance of the Work Plan tasks.

4.8.1.3. An outline of any deliverable that will be produced from the data sufficient to provide an understanding of the scope of the deliverable that will result from the Work or investigation.

4.8.2. The documents that comprise a Project Operations Plan ("POP") shall either be referenced from previous documents or be prepared to accompany each Work Plan in support of all field activities and investigations conducted under this 2007 SOW as described in Section 4.8.1. Each Work Plan's POP will be prepared in accordance with Attachment A of this 2007 SOW.

4.8.3. Any revised submittals shall contain a letter restating EPA's full comment and how that comment was addressed. All submittals and responses by the Work Settling Defendants shall refer to the specific location where supporting data are presented.

4.8.4. Implementation of Work will be performed as set forth in the schedules contained in each approved or modified deliverable. Delivery of draft and final documents will be according to the schedule in the approved or modified Work Plan.

4.8.5. All plans, deliverables and reports identified in the 2007 SOW for submission to EPA shall be delivered to EPA and NHDES in accordance with the Amended Consent Decree.

4.8.6. The Work Settling Defendants shall submit four copies of any plan, deliverable, or report to EPA for review and approval and one copy to NHDES for review and comment. One electronic copy of the text and to the extent practical, any and all tables and figures, shall be submitted in an editable format compatible with EPA hardware and software and shall accompany each deliverable. A second electronic copy of the deliverable in a locked format will

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be submitted at the same time to ensure that there is an unedited record version of the deliverable. In an effort to increase public access and decrease file storage requirements, NHDES requests that deliverables approved by EPA, following a reasonable opportunity for review and comment by NHDES, also be submitted electronically and adhere to the format and submittal process described at:

[http://www.des.nh.gov/orcb/doclist/Electronic\\_Submittal\\_Guidelines.pdf](http://www.des.nh.gov/orcb/doclist/Electronic_Submittal_Guidelines.pdf)

At EPA's request, the Work Settling Defendants shall deliver an additional copy as an unbound, photo-ready original with two-sided printing and marked "Draft" in bold type in the header of each page.

4.8.7. Any draft deliverable transmitted to USEPA and NHDES shall include, in a prominent location in the document, the following disclaimer: "Disclaimer: This document is a DRAFT document prepared by the Work Settling Defendants under a government Consent Decree. This document has not undergone formal review by the U.S. Environmental Protection Agency and New Hampshire Department of Environmental Services. The opinions, findings, and conclusions, expressed are those of the author and not those of the U.S. Environmental Protection Agency and the New Hampshire Department of Environmental Services." All draft deliverables shall contain the following "Draft – Work in Progress" in either the header or footer of the document. Draft deliverables will not be made available to the public prior to completion of EPA review and approval, following a reasonable opportunity for review and comment by NHDES. Exceptions may be granted if all parties mutually consent to release documents to stakeholders with an active interest.

4.8.8. The schedules for completion of deliverables and required activities shall be based on the Amended Consent Decree, this 2007 SOW, the schedules in the approved or modified Work Plans, and, as appropriate in the contingent remedy, the 1993 Consent Decree and 1993 SOW. The schedules in approved Work Plans will control the conduct of the Work.

## **5. SAMPLING, ASSESSMENT AND RESPONSE ACTIONS**

The objectives of the actions in this section are to locate and eliminate present risks at the Site. The actions herein encompass several elements of the remedy that do not fall neatly into the category of Source Control or Management of Migration, but for clarity in the 2004 AROD were described as part of one category or the other. These elements are key to managing risk at the Site and in reducing the time and costs of remediation. These Pre-Design Investigations ("PDIs") will also better determine future monitoring needs, may assist in the design of the other elements of the 2004 AROD, or provide information to support additional Response Actions. Prior to the lodging and entry of the Amended Consent Decree, several of these PDIs have already been initiated and executed by the Work Settling Defendants. The performance of these PDIs shall be governed by the schedules set forth in the applicable, approved or modified Work Plans.

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## **5.1 EcoToxicity and Human Health Assessment of the Cocheco River PDI**

The Work Settling Defendants shall develop and implement the ECOTOXICITY AND HUMAN HEALTH ASSESSMENT OF THE COCHECO RIVER PDI WORK PLAN (the “Cocheco Sediment PDI - WP”) for the conduct of sediment sampling in the Cocheco River. Implementation of the Cocheco Sediment PDI-WP will result in the ECOTOXICITY AND HUMAN HEALTH ASSESSMENT OF COCHECO RIVER SEDIMENT PDI REPORT (the “Cocheco Sediment PDI Report”). The draft Cocheco Sediment PDI Report will be delivered to EPA and NHDES in accordance with the schedule established in the Cocheco Sediment PDI-WP approved or modified by EPA.

In determining the risk to the environment, the Work Settling Defendants shall conduct the second tier of the ecological assessment protocols of EPA and NHDES to determine if sediments in the Cocheco River are harmful to aquatic life (i.e., sediment toxicity bioassays). If the results of the second tier ecological assessment are determined by EPA to indicate toxicity, the Work Settling Defendants will perform the third tier of the ecological assessment protocol (i.e., benthic community assessment). Sampling will also assess the risk to human health from arsenic in sediments as well as the transport and fate of arsenic in the Cocheco River. The following subsections describe how the Work Settling Defendants will perform these actions:

### **5.1.1. Sampling**

For the Cocheco River, sampling will consist of a sufficient number of samples to determine the impact of Site ground water and surface water discharge to the sediment of the Cocheco River. Sufficient sediment samples shall be taken for use in sediment toxicity tests to be performed in accordance with the ecological assessment protocol of EPA and NHDES.

### **5.1.2. Assessment**

The Work Settling Defendants shall prepare the Cocheco Sediment PDI Report for the Cocheco River based on the results of the sampling, and will summarize the results of all sediment and bioassay testing.

For the Cocheco River, the Sediment PDI Report shall contain sufficient information to prepare risk assessments for the sediments and to evaluate the toxicity to ecological and human receptors. The triad approach in the State of New Hampshire’s Guidance Document for the Evaluation of Sediment Quality (WD-04-9, 2004) will be used to accomplish the sediment ecological risk assessment. This approach includes chemical analysis, sediment toxicity bioassays, and community assessments as warranted. If the results of the testing of any sediments indicate that the sediments are toxic in accordance with criteria established in the draft NHDES guidance on sediment quality evaluation or the results are inconclusive, EPA, after consultation with NHDES, may direct the Work Settling Defendants to perform a Tier 3 assessment of biota in the Cocheco River. If a Tier 3 assessment is required, the Work Settling Defendants shall submit an addendum to the Cocheco River Sediment PDI-WP that describes the methods to be employed and the activities to be performed to accomplish the Tier 3 assessment.

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### 5.1.3. Response Actions

Based on the results of the Cocheco River Sediment PDI Report and any other sediment sampling, EPA will determine if any Response Actions, other than institutional controls and access restrictions as outlined in Section 4.7., herein, are required based upon unacceptable human health or ecological risk and, if so, will convey the project scope and schedule. If a Response Action is required, Work Settling Defendants shall prepare a Work Plan to support such Work. The Work Plan shall evaluate appropriate remedies and propose actions to address those sediments that exceed ecological risk or exceed human health risk criteria. Once EPA determines that a Response Action is required, the Work Settling Defendants shall prepare a *Cocheco Sediment Response Action Work Plan* (CSRA-WP) to conduct the Response Action that incorporates the Performance Standards of Section 4.4. In addition to those requirements in Section 4.8, the SRA-WP shall describe sediment sampling to confirm that the sediment remedy continues to be protective of human health and ecological receptors. At the conclusion of the Response Action, the Work Settling Defendants shall prepare a *Cocheco Sediment Response Action Summary Report* that will describe the nature and scope of the sediment remedy and the confirmation testing results.

### 5.1.4. Future Monitoring

The Cocheco River shall be sampled on an annual basis as outlined in Sections 4.4.2 and 5.1. Sampling results shall be reported in the annual report described in Section 5.7., herein. If any Response Actions are necessary, due to either human health or ecological risks they shall be performed in accordance with Section 5.1., herein.

## 5.2 Indoor Air PDI

The Work Settling Defendants shall develop and implement an INDOOR AIR PDI WORK PLAN (the "Indoor Air PDI-WP").

### 5.2.1. Sampling

This PDI will be conducted in the area of those residences that overlie or are in close proximity to the Eastern Plume, following appropriate indoor air guidance.<sup>3</sup> The goal is to determine if volatile COCs in the contaminated ground water beneath the residences on Glen Hill and Tolend Roads are entering those residences in vapor form at concentrations that pose an unacceptable risk to inhabitants. The Indoor Air PDI-WP will describe the number and types of samples and analyses. The sampling program will address conditions in the vicinity of all residences on Tolend Road and Glen Hill Road that overlie the Eastern Plume.

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<sup>3</sup> Draft *Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils* (Subsurface Vapor Intrusion Guidance), USEPA, November 26, 2002, and *Vapor Intrusion Guidance*, NHDES, July 2006.

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#### 5.2.2. Assessment

Based on the results of samples and analysis from the implementation of the Indoor Air PDI-WP, the Work Settling Defendants shall submit the INDOOR AIR PDI REPORT (the "Indoor Air PDI Report") that will describe the results of sampling in accordance with the approved Work Plan. If EPA determines that a possible pathway exists, USEPA will require additional investigation and assessment of potential human health risks associated with indoor air exposures. The Indoor Air PDI Report will be delivered in accordance with the schedule established in the Indoor Air PDI-WP approved or modified by EPA.

#### 5.2.3. Response Actions

Based on the results of the Indoor Air PDI Report, EPA will determine if any Response Actions are required to address human health risks and convey the project scope and schedule to the Work Settling Defendants. If a Response Action is required, Work Settling Defendants shall prepare an *Indoor Air Response Work Plan* (IAR-WP) to conduct the Response Action that incorporates the Performance Standards of Section 4.6., herein, to support such Work. At the conclusion of the Response Action, the Work Settling Defendants shall prepare an *Indoor Air Response Action Summary Report*.

#### 5.2.4. Future Monitoring

The Work Settling Defendants shall continue to assess any potential impacts to indoor air on an annual basis under EPA and the State guidelines for assessing indoor air. Sampling results shall be reported in the annual report described in Section 5.7., herein. If any Response Actions are warranted, they shall be performed in accordance with Section 5.2.3.

### 5.3 Northwest Landfill PDI

The small, intermittent stream in the northwest corner of the landfill (the Northern Perimeter Ditch), historically sampled as point SW-E, has surface water concentrations of volatile organic contaminants such as *cis*-1,2 dichloroethylene and vinyl chloride that indicate a potential source of high ground water concentrations in the northwest corner of the landfill. The Northwest Landfill PDI-WP will result in the Northwest Landfill PDI Report that outlines what contamination is present and the potential Response Actions to address that contamination.

#### 5.3.1. Sampling

Following approval or modification of the Northwest Landfill PDI-WP, the Work Settling Defendants shall collect sufficient surface water, ground water, sediment, and soil samples to determine the source(s) of contamination in the area up-gradient of sampling point SW-E.

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### 5.3.2. Assessment

The Work Settling Defendants shall prepare the Northwest Landfill PDI Report that will summarize the results of the sampling and analysis and describe the nature and location of Source Area(s).

### 5.3.3. Response Actions

If EPA determines that a Response Action is required, the Work Settling Defendants shall prepare a *Northwest Landfill Response Action Work Plan* (NWLFR-WP). The NWLFR-WP shall evaluate potential methods to address high concentrations of contaminants either through excavation or other *ex situ* or *in situ* treatment technologies. The NWLFR-WP shall describe the sampling needed to confirm that the Response Action has achieved a significant reduction in contamination and that Performance Standards will be attained in a reasonable time. At the conclusion of the Response Action, the Work Settling Defendants shall prepare a *Northwest Landfill Response Action Summary Report* that will describe the nature and scope of the Response Action undertaken and future actions and monitoring.

## 5.4 Ground Water Model

A draft of this model is currently contained in Appendix N of the January 2004 Draft Revised Focused Feasibility Study (RFFS).<sup>4</sup> The Work Settling Defendants will take the information in Appendix N and, in consultation with representatives of USEPA and NHDES, revise it to address comments expressed by the Agencies during the May 16, 2005 meeting between the Agencies and the Work Settling Defendants for design of the 2004 AROD remedy components. Additionally, the Work Settling Defendants will review prior information and, if necessary, collect additional field data in accordance with other PDIs conducted at the Site to determine and verify parameters employed in the model. The objective will be to construct a model that simulates the effect on ground water flow of constructing and operating the Source Control remedy and, in the Southern Plume, constructing and operating a pump and treat system. The Ground Water Model will be important in designing the air-sparging trench and Southern Plume ground water extraction and treatment system.

## 5.5 Fate and Transport Model

A draft of a Fate and Transport Model for the Site currently accompanies the Ground Water Model in Appendix N of the RFFS. The Work Settling Defendants will take the information in Appendix N and revise it according to comments from EPA and NHDES provided at the May 16, 2005 meeting and in previous correspondence for design of the 2004 AROD remedy components. The objective of this model will be to simulate the fate of COCs in ground water beneath the landfill and in the Eastern and Southern Plumes. The Fate and Transport model will

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<sup>4</sup> GeoInsight, Draft Revised Focused Feasibility Study, January 30, 2004.

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be important in the design and operation of the air-sparging trench and Southern Plume ground water extraction and treatment system.

## **5.6 Model Data Acquisition**

If field activities are necessary to obtain data or inputs for the Ground Water and for the Fate and Transport Models, the Work Settling Defendants shall consult with EPA and NHDES regarding the data to be collected and its quality.

## **5.7 Site-Wide Environmental Monitoring Program**

The current Environmental Monitoring Program (the “EMP”) has been in use for more than 12 years. The EMP must be updated with respect to the media to be monitored, the types of analysis, and frequency of sampling. The Work Settling Defendants shall develop a revised EMP (the “REMP”) based on existing information and from available results of the PDIs being performed. It is expected that sampling will focus on the migration of contaminants from the Site in ground water, sediments, air, and surface water.

A draft REMP should be prepared for submission to EPA for review and approval within 12 months after the Regional Administrator signs the Amended Consent Decree. Thereafter, it should be re-examined and modified every two years, at a minimum, or as directed by EPA. Results from the REMP shall be submitted to EPA in an annual report titled DOVER LANDFILL ENVIRONMENTAL MONITORING REPORT, 200X (the “REMP Annual Report”) for review and comment. The deadline for submission of the first REMP Annual Report shall be one year after EPA approves or modifies the REMP.

The REMP Annual Reports shall contain the results of all monitoring conducted in the past year and contain a tabular comparison of that year’s sampling with all previous annual monitoring results. This includes physical inspections and evaluations of the effectiveness of any Response Actions taken at the Site or other investigations, and any wetlands/floodplain restoration and maintenance of the wetlands/floodplain. The results of wetland restoration monitoring shall be described with recommendations for meeting the Performance Standards in Section 4.

## **5.8 Institutional Controls**

In accordance with Section X of the 1993 Consent Decree, Section J of the 1993 SOW (listed as Section I in the text), and 2004 AROD, the Work Settling Defendants shall secure and maintain Institutional Controls at the Site.

At least once per year, the Work Settling Defendants shall make reasonable efforts to ascertain whether residences in areas subject to institutional controls are in compliance with applicable control requirements and shall send an ANNUAL INSTITUTIONAL CONTROL VERIFICATION LETTER REPORT (the “Annual IC Letter Report”) to EPA and NHDES certifying that Institutional Controls, including the Dover and Madbury municipal ordinances prohibiting the use of ground water or equivalent protective measures, remain in effect and

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describing the findings of these efforts. Any time the Work Settling Defendants know, or have reason to believe, that a violation of the Institutional Controls is occurring they shall notify EPA within 24 hours and take appropriate action as directed by EPA.

#### 5.8.1. Groundwater Management Permit

Within 45 days after lodging of the Amended Consent Decree, the Work Settling Defendants shall submit a Groundwater Management Permit (“GMP”) application that meets the requirements of Env-Or 607, as amended, to EPA and the State. The GMP application shall contain a plan that delineates a proposed Groundwater Management Zone (“GMZ”) and identifies a sufficient number of monitoring wells to delineate a “clean edge” of the GMZ and to monitor the effectiveness of the remedial measures and ground water quality. Upon issuance of the GMP from NHDES, the Work Settling Defendants shall record notice of the permit in the Registry of Deeds for all lots of record within the GMZ and follow other appropriate notification protocols per Env-Or 607, as amended. The Work Settling Defendants shall apply for a renewal of the GMP every 5 years per Env-Or 607, as amended.

### 6. SOURCE CONTROL

The Source Control component of the 2004 AROD shall be designed and constructed to eliminate the discharge of Site COCs in ground water at the WMA boundary at concentrations above ICLs, to restore ground water outside the WMA boundary to meet State ground water standards, and to enable the landfill to be closed using Clean Closure standards.<sup>5</sup> The remedial measures for the Source Control remedy are described in detail in Section K of the 2004 AROD. The Performance Standards for each sub-component of the Source Control remedy are detailed in Section 4, herein.

The remedy proposed for Source Control is innovative and complex. Therefore, it requires a Pre-Design Investigation to obtain information required for the definitive design elements and it requires a Contingent Remedy which is outlined in Section 9.1., herein. To avoid delay in implementing the contingent Source Control remedy, should the air-sparging trench fail and operation as a ground water extraction trench prove to be impractical, the 100% Source Control Remedial Design, dated December 1996, shall be updated as described in Section 9.1.1., herein.

#### 6.1 Source Control Pre-Design Investigations

There are two pre-design investigations necessary to design and operate the Source Control remedy for the Site selected in the 2004 AROD. These include the Air-Sparging Trench Pre-Construction PDI and the Outdoor Air PDI. Additional data from the 1994 and 1995 PDIs, as well as the Southern Plume PDI, MNA PDI, and Ground Water and Fate & Transport PDIs will supply data critical to the Source Control design as well. The Outdoor Air PDI will be

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<sup>5</sup> USEPA, March 16, 1998. Risk-based Clean Closure memorandum from Elizabeth Cotsworth, Acting Director, Office of Solid Waste.

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implemented during the Source Control Remedial Design phase and continue, with modifications, through the Source Control Remedial Action.

#### 6.1.1. Air-Sparging Trench Pre-Construction PDI

Within 60 days following signature of the Amended Consent Decree by the Regional Administrator, the Work Settling Defendants shall submit the AIR-SPARGING TRENCH PRE-DESIGN INVESTIGATION WORK PLAN (the "Air-Sparging PDI-WP") to gather data to support design and construction of the Source Control Remedial Design. The Air-Sparging PDI-WP will result in an AIR-SPARGING PDI FINAL REPORT (the "Air-Sparging PDI Report") that outlines the results of the PDI and provides parameters for designing the full-scale Source Control remedy at the Site.

The goal of this PDI will be to determine the depth, location and construction methods for the air-sparging trench and the proper means to operate, maintain and monitor the air-sparging trench. The investigation will determine:

6.1.1.1. The subsurface stratigraphy along the path of the trench.

6.1.1.2. The depth to which the air-sparging trench segments will need to be excavated to key into the marine clay, subject to confirmation during design that this requirement is necessary to effectively intercept and treat all COCs migrating from the WMA in ground water at concentrations above ICLs.

6.1.1.3. Other physical parameters important to the design of an air-sparging trench. This also includes a ground water monitoring plan based on the Performance Standards contained in Section 4.3 and further developed in this Section.

6.1.1.4. The location of potential source areas and areas where the concentrations of COCs in ground water or soil exceed the treatment capacity of the air-sparging trench.

6.1.1.5. For those areas identified pursuant to paragraph 6.1.1.4., EPA may require additional investigations to determine the nature of contamination in that locality, and if appropriate may require that remedial action(s) be proposed for each identified area to attain cleanup levels that will prevent adverse impacts on performance of the Source Control remedy and attain Performance Standards in a reasonable time frame. These actions may include *in situ* treatment technologies or *ex situ* techniques.

6.1.1.6. A detailed characterization of ground water contamination and stratigraphy along the line of the trench and in up-gradient areas, where such contamination may impact the air sparging remedy. Contamination characteristics shall be determined through vertical profiling or other drilling techniques approved or modified by EPA. Stratigraphy shall be determined by drilling and geophysical methods, as appropriate.

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6.1.1.7. Based on Sections 6.1.1.1. - 6., above, the Work Settling Defendants shall recommend to EPA the location of pilot segment(s) to be constructed to demonstrate the adequacy of the design performance of the air-sparging technology. In determining performance, EPA will consider factors such as the effectiveness of the trench to immobilize and allow the extraction of arsenic at its highest concentrations, its effectiveness in attaining cleanup levels for all COCs emanating from the landfill at concentrations above ICLs, and its ability to be installed to the marine clay or other suitable depth to intercept and treat all COCs migrating from the WMA in ground water at concentrations above ICLs.

#### 6.1.2. Ditch and Swale Sediments

The Work Settling Defendants shall monitor arsenic in the sediments and surface water in the Northern and Southern Perimeter Ditches and in the Drainage Swale annually. The amount and distribution of sediments in the Northern and Southern Perimeter Ditches and Drainage Swale that exceed the 50 mg/kg standard for arsenic, which was established in the 1991 ROD, shall be removed and disposed off-site, unless EPA determines that on-site management is practicable, protective of human health and the environment, and is in compliance with ARARs. If a response action is required to address sediment conditions in the Perimeter Ditches or Swale, the Work Settling Defendants shall prepare a *Ditch and Swale Sediment Response Action Work Plan* ("DSSRA-WP") to remediate such sediments and shall prepare and submit to EPA and the State for review and approval a Response Action Summary Report at the conclusion of the sediment removal. Sediment sampling and reporting of results shall be described in the Revised Environmental Monitoring Plan.

#### 6.1.3. Outdoor Air PDI

Although primarily considered a part of the Remedial Action, pre-construction monitoring must be performed to establish base-line, ambient air conditions prior to implementation of the selected remedy together with performance monitoring during remedy implementation.

6.1.3.1. This investigation requires sampling outdoor air before, during, and following construction activities to ensure that implementation and operation of the Source Control remedy does not pose a risk to human health from exposure to COCs in outdoor air. Areas to be sampled include, at a minimum, near SW-E (in the Northern Perimeter Ditch), near the head of the Drainage Swale and at the bottom of the Drainage Swale as it enters the Cocheco River.

6.1.3.2. The Work Settling Defendants shall develop and implement the OUTDOOR AIR PRE-DESIGN INVESTIGATION WORK PLAN (the "Outdoor Air PDI-WP") for the conduct of ambient air sampling before, during and after any construction activities. The Outdoor Air PDI-WP will describe how monitoring will occur to establish base-line conditions, and then how monitoring will occur during implementation of the Source Control Remedial Action. The Outdoor Air PDI-WP will result in an OUTDOOR AIR PDI FINAL REPORT (the "Outdoor Air PDI Final Report") that will describe all the results of the monitoring. Implementation of the Outdoor Air PDI-WP must be initiated 3 months prior to construction beginning, and the Outdoor Air PDI

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Final Report must be submitted 3 months after EPA's determination that the air-sparging trench is operational and functional.

6.1.3.3. If monitoring demonstrates that construction activities at the Site cause outdoor air to exceed Federal or State of New Hampshire Air Quality Standards, construction activities will be suspended, and the Work Settling Defendants shall submit to EPA an *Outdoor Air Abatement Plan* to attain compliance. The plan shall be submitted within 14 days of detected exceedances attributed to Site remediation activities.

## **6.2 Source Control Remedial Design**

The Source Control Remedial Design Phase shall consist of developing a full design to construct the air-sparging trench as described in Section K of the 2004 AROD. The Work Settling Defendants shall design the air-sparging trench to intercept ground water with concentrations of COCs above ICLs at the edge of the WMA and either capture or destroy those contaminants. No contaminants shall exit the down-gradient side of the air-sparging trench at concentrations exceeding ICLs as defined in Section K of the 2004 AROD. The Work Settling Defendants shall include in the design of the air-sparging trench those actions to address concentrations of COCs in the WMA that may exceed the treatment capacity of the trench that are identified by the Air-Sparging PDI described in Section 6.1.1.

### **6.2.1. Source Control Remedial Design Work**

This remedy component is intended to halt the flow of contaminants exceeding ICLs from the WMA and restore ground water beneath the WMA to concentrations consistent with EPA's Clean Closure Policy. To complete this component the Work Settling Defendants shall:

6.2.1.1. Inspect, maintain, and repair the natural cover that currently exists on the landfill periodically and meet the landfill cover Performance Standards in Section 4.2. throughout operation of the air-sparging trench.

6.2.1.2. In areas where concentrations of ground water contaminants are identified through the Air-Sparging PDI to exceed the treatment capacity of the trench, design a treatment system or a ground water extraction and *ex situ* or *in situ* treatment system, as approved or modified by EPA, that reduces concentrations in ground water so that the air-sparging trench can function effectively, meets the Performance Standards in Section 4.3., and that minimizes operating time of the air-sparging trench.

For instance, one area of high ground water concentrations is located in the southwestern corner of the landfill. The ground water in this area is contaminated principally by THF with concentrations that may exceed the treatment capacity of the air-sparging trench. This area will be characterized during the Air-Sparging PDI Work and, if appropriate, addressed through an *in situ* treatment system or a ground water extraction and treatment system designed to attain ICLs. Treated ground water will be re-injected into the landfill at an up-gradient location if such re-injection will not adversely affect the operation of the Source Control remedy.

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6.2.1.3. Design an air-sparging trench to meet the Performance Standards contained in Section 4 of this 2007 SOW and the standards contained in this Section.

6.2.1.3.1. The air-sparging trench shall be designed to intercept all COC-impacted ground water that exceeds ICLs flowing from the WMA. The approximate length of the air-sparging trench is 3,000 to 4,000 linear feet. The numbers, locations, and orientations of the trench segments will be determined through pre-design efforts and detailed in the Source Control design documents, subject to approval or modification by EPA, and will specifically address ground water flow and COC impacts along the downgradient toe of the landfill.

6.2.1.3.1.a. The depth of the air-sparging trench will be determined by the depth of the marine clay into which the trench will be installed unless pre-design and design analyses demonstrate that the trench can be operated at a depth above the marine clay surface in a manner that ensures that ground water contaminated with COCs above ICLs does not flow under the air-sparging trench.

6.2.1.3.1.b. The Work Settling Defendants shall design the air-sparging trench such that contaminated ground water from the up-gradient, landfill side of the trench enters the air-sparging trench, passes through the trench material for treatment, then exits the down-gradient side of the trench at concentrations that do not exceed the ICLs for all COCs.

6.2.1.3.1.c. The air-sparging trench shall be designed to intercept, capture or destroy all COCs emanating from the WMA in ground water at concentrations above ICLs. The air-sparging trench shall be designed such that it can be converted to extract ground water for *ex situ* treatment. Air emitted from the air-sparging trench is not expected to require treatment; however, the air vents will be designed so that they may be retro-fitted with treatment devices if necessary.<sup>6</sup>

6.2.1.3.2. One or more hydraulic barriers shall be designed to direct leachate emanating from the landfill through the air-sparging trench. The design may be modified, if EPA agrees with the Ground Water and/or the Fate and Transport modeling results that are used to support such a modification.

6.2.1.3.3. The air-sparging trench shall be designed in segments that will allow each segment to be operated independently. Although air-sparging will be the primary mode of operation, design flexibility must enable the air-sparging trench to be operated as a ground water extraction trench or, if appropriate, a re-injection trench in the future. The air-sparging trench will be designed to operate as described below:

6.2.1.3.3.a. As ground water passes through the trench, air-sparging will capture target volatile COCs, such as vinyl chloride, and 1,2 DCE, as well as

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<sup>6</sup> RFFS, January 30, 2004, pages 4-27.

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hydrocarbons such as benzene in the ground water. Captured volatile COCs will be discharged to the atmosphere if they are below regulatory standards. If not, they will be captured or treated with methods that will attain compliance with State and federal air pollution control standards. Concentrations of COCs in the ground water exiting the down-gradient side of the air-sparging trench will be at ICLs.

6.2.1.3.3.b. The aerobic environment created by the air-sparging trench will also allow micro-organisms to degrade THF. This aerobic environment will also co-precipitate iron and arsenic so that arsenic concentrations in ground water will reach ICLs before exiting the down-gradient side of the air-sparging trench.

6.2.1.3.3.c. Should the precipitation of inorganic compounds or organic growths cause fouling in the trench such that the hydraulic conductivity through the trench is reduced and impairs performance of the remedy, the porous media in the air-sparging trench will be excavated or operational hydraulic conductivity will be restored by other technologies proposed by the Work Settling Defendants and approved by EPA. The design must accommodate removal or *in situ* stabilization of precipitated arsenic through a method approved or modified by EPA, unless it is demonstrated through monitoring that precipitated arsenic will not re-mobilize after shutdown of the trench. The design must incorporate hydraulic conductivity monitoring in the trench, the up-gradient aquifer, and the down-gradient aquifer to detect fouling, either by inorganic or organic substances, or channelization of air, either in the media or the surrounding aquifer, or significant hydraulic mounding that may impair treatment in the trench or altering ground water flow patterns in a manner that impairs the effectiveness of the remedy.

#### 6.2.2. Source Control Remedial Design Work Plan

Within 60 days after EPA approval or modification of the Air-Sparging PDI Report, the Work Settling Defendants shall submit a SCRD-WP that incorporates the design elements in Section 6.2.1. and any other activities that are necessary to complete the Remedial Design. The SCRD-WP shall include, at a minimum and in addition to the requirements of Section 4.8.1., herein, a detailed description of all activities to be undertaken in connection with the design and implementation of the air-sparging system. The detailed descriptions shall contain a statement of purpose and objectives, identification of the specific activities, and a detailed schedule for the completion of the Source Control Remedial Design. The SCRD-WP shall also designate the following submissions and supply a schedule for submitting the 30%, 75% and 100% Source Control Remedial Design documents, plans and specifications as set forth in this Section. EPA may also require several technical meetings to discuss design elements based on the review of any of the Remedial Design documents.

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### 6.2.3. 30% Remedial Design Submission

Within 120 days of receiving EPA's approval or modification of the SCRD-WP, the Work Settling Defendants shall submit to EPA the 30% Source Control Remedial Design ("SCRD") submission. The 30% SCRD submission is a conceptual design that contains those criteria identified in Section 6.2.1. and 6.2.2., above. In addition, the 30% SCRD submission shall include, at a minimum, the results of all field investigations, a discussion of how ARARs are being met by the SCRD, the design criteria, the project delivery strategy, preliminary plans, drawings, sketches, and calculations, an outline of the required technical specifications and a preliminary construction schedule and costs.

### 6.2.4. 75% Remedial Design Submission

Within 90 days of receiving EPA's approval or modification of the 30% SCRD submission, the Work Settling Defendants shall submit to EPA the 75% SCRD submission. The 75% SCRD submission is an intermediate design that contains all the components of the approved or modified 30% SCRD, as well as additional information sufficient to construct the remedy. The 75% SCRD submission shall also include, at minimum, critical milestones in the construction, a discussion of how ARARs are being met by the SCRD, the design criteria, the project delivery strategy, intermediate plans, drawings, sketches, and calculations, all required technical specifications in detail and an intermediate construction schedule and costs.

### 6.2.5. 100% Remedial Design Submission

Within 60 days of receiving EPA's approval or modification of the 75% SCRD submission, the Work Settling Defendants shall submit the 100% SCRD reflecting those changes approved or modified by EPA in the 75% SCRD submission. The 100% SCRD submission shall address all Source Control components and contain, but not be limited to:

6.2.5.1. The final design plans and specifications in reproducible format.

6.2.5.2. Final bid documents.

6.2.5.3. A contingency plan that shall address the safety of on-site construction workers and the local affected population in the event of an accident or emergency.

6.2.5.4. A detailed schedule of activities to implement the entire Source Control Remedial Action.

6.2.5.5. A constructability review that evaluates the suitability of the project and its components in relation to the Site.

6.2.5.6. A QA/QC check of the design plans with the technical specifications.

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6.2.5.7. A detailed statement of how ARARs are met, and a statement of all assumptions and all drawings and specifications necessary to support the analysis of compliance with ARARs.

### **6.3 Source Control Remedial Action**

The Source Control Remedial Action is intended to allow infiltrating water to mobilize COCs in the landfill and convey them to an air-sparging trench to be removed, immobilized or degraded.

#### **6.3.1. Remedial Action Source Control Work Plan**

The Source Control Remedial Action construction activities shall include, but are not limited to: development of a REMEDIAL ACTION SOURCE CONTROL WORK PLAN ("SCRA-WP") and other actions listed below.

Within 90 days of receiving EPA's approval or modification of the 100% SCRD, the Work Settling Defendants shall submit to EPA the SCRA-WP for implementing the Source Control Remedial Action ("SCRA"). The SCRA-WP shall contain, in addition to those items in Section 4.8.1. and 4.8.2., herein, the following:

6.3.1.1. The sequence of air-sparging trench construction activities showing how each segment will be installed, accompanied by a schedule.

6.3.1.2. A step-by-step description of how each air-sparging trench segment will be constructed and how staging areas will be moved to facilitate construction of the trench and associated monitoring network.

6.3.1.3. A description of the monitoring system as described in Section 6.4., herein.

6.3.1.4. A CQAPP as outlined in Attachment 4 of the 1993 SOW.

#### **6.3.2. Pre-Construction Conference**

Within 60 days of receiving EPA's approval or modification of the SCRA-WP, the Work Settling Defendants shall hold a PRE-CONSTRUCTION CONFERENCE. The participants shall include all Work Settling Defendants involved in the SCRA and their representatives, EPA and the State.

#### **6.3.3. Initiation of Construction**

Within 60 days of receiving EPA's approval or modification of the SCRA-WP, the Work Settling Defendants shall initiate SCRA construction activities in accordance with the construction sequence and schedule contained therein.

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#### 6.3.4. Meetings During Construction

During the construction period, the Work Settling Defendants and their construction contractor(s) shall meet with EPA and NHDES regarding progress of construction at least bi-weekly, or as otherwise agreed to by all parties.

#### 6.3.5. Operations and Maintenance Plan

Within 30 days following the 75% construction complete date, as described in the approved or modified SCRA-WP schedule, the Work Settling Defendants shall submit to EPA a SOURCE CONTROL REMEDIAL ACTION OPERATION AND MAINTENANCE PLAN (the “SCRA-O&M Plan”) to ensure the long-term, continued effectiveness of the SCRA. The SCRA-O&M Plan shall include, at a minimum, the following:

6.3.5.1. A description of normal operations and maintenance and inspection schedules.

6.3.5.2. A description of potential operational problems, including arsenic fouling of the trench media or aquifer matrix by either inorganic or organic precipitates, and anticipated measures to detect and correct these operational problems.

6.3.5.3. A description of routine process performance, monitoring and analysis, which includes the requirements in Section 6.4.

6.3.5.4. A description of methods and frequency of assessing optimization of operation and monitoring, which includes the requirements in Section 6.4.

6.3.5.5. An operational health and safety plan.

6.3.5.6. Annual operation and maintenance budget projections over the lifetime of the SCRA.

6.3.5.7. Record-keeping and reporting requirements.

6.3.5.8. In addition to the above, for monitoring wells, extraction wells, and any equipment that recovers contaminated ground water or air from the subsurface as part of the Source Control Remedial Action, the SCRA-O&M Plan shall also include, at a minimum, the following:

6.3.5.8.1. A provision for prompt and proper abandonment in accordance with State ARARs and, if needed, replacement, as required by EPA, of any wells or equipment that are unusable or that have become unusable during the SCRA-O&M activities.

6.3.5.8.2. A schedule for inspection, continued maintenance, and repair or replacement, if necessary, of all wells and subsurface recovery equipment associated with the SCRA.

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6.3.5.8.3. A schedule for continued assessment of the effectiveness of any well or subsurface extraction or monitoring equipment. Those wells or equipment that are no longer effective shall be proposed for abandonment as required in subparagraph 6.3.5.8.1. above. This program shall continue until a Certificate of Completion is issued as required in Section 10.4., herein.

6.3.5.8.4. A provision for the addition of new wells or equipment to assess any potential contaminant migration or obtain other hydrogeological information.

#### 6.3.6. Final Construction Inspection

Within 45 days after the Work Settling Defendants conclude that SCRA construction has been fully (100%) completed, the Work Settling Defendants shall schedule and conduct a Pre-Final Source Control Construction Inspection to identify punch-list items. Within 75 days of the Pre-Final Inspection, the Work Settling Defendants shall schedule and conduct a FINAL SOURCE CONTROL CONSTRUCTION INSPECTION to determine completeness. Each inspection shall include all Work Settling Defendants and their representatives, EPA and NHDES.

#### 6.3.7. Final Construction Report

Within 60 days of completion of the Final Source Control Construction Inspection, the Work Settling Defendants shall submit to EPA for review and approval the FINAL SOURCE CONTROL REMEDIAL ACTION CONSTRUCTION REPORT: AIR SPARGING TRENCH, verifying that all punch-list items are addressed and that the Source Control remedy construction is complete. The constructed Source Control Remedial Action is Operational and Functional ("O&F") once EPA approves or modifies the Report.

### 6.4 Source Control Remedy Operation, Assessment, and Optimization

Work Settling Defendants shall implement the Work detailed in the SCRA-O&M Plan upon approval or modification of the Final Source Control Remedial Action Construction Report.

The Source Control remedy shall be operated to reduce COCs migrating from the WMA to ICLs prior to exiting the down-gradient side of the air-sparging trench as described in Section 4.3, herein. Assessment shall consist of monitoring to establish that COCs above ICLs do not migrate beyond the WMA and air-sparging trench. If EPA determines that monitoring indicates that the trench is not performing as required, the Source Control remedy shall be optimized to attain Performance Standards and ICLs. Optimization may include operational adjustments, conversion to a ground water extraction or re-injection system, as well as other targeted supplemental response actions. Remedy assessment and optimization of performance will be a critical facet of the air-sparging trench operation. The key will be assessing, optimizing, and determining if operation of the air-sparging trench can treat COCs in ground water migrating from the WMA to ICLs and restore ground water throughout the WMA. The elements to be evaluated are described below:

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#### 6.4.1. Monitoring of Remedy Performance

The air-sparging trench shall be monitored and assessed throughout the active length to determine whether COC concentrations in the ground water migrating from the WMA are being treated to meet ICLs. The monitoring techniques include, but are not limited to:

6.4.1.1. Several sets of Performance Monitoring Wells (“PMWs”) shall be installed inside and outside the air-sparging trench. The locations and construction of all PMWs will be designed to evaluate performance of the remedy with regard to both hydraulics and treatment of COCs to meet ICLs and attain Performance Standards.

Inside the trench a sufficient number of PMWs shall be installed vertically and/or laterally to evaluate COC concentrations and hydrologic parameters up-gradient of, within, and down-gradient of the sparging trench. These wells shall be monitored at an interval sufficient to effectively evaluate performance. The objectives of the monitoring network design will be to assess ground water flow, possible clogging of the trench backfill media and nearby native soils, and treatment effectiveness in terms of changes in COC concentrations. The design and locations of the PMWs will be based upon the results of the PDI; it should be noted that, based upon currently available information, the PMWs will likely be constructed as couplets or triplet wells with differing screen intervals in the wells that comprise the couplet or triplets to ensure adequate hydrogeologic and COC concentration monitoring both vertically and laterally.

6.4.1.2. After each segment of the air-sparging trench begins operation the PMWs shall be sampled every three months initially to determine performance and a more appropriate sampling frequency based on flow velocities and conditions created by air sparging. Thereafter, monitoring will be conducted based on a frequency approved or modified by EPA that is designed to monitor seasonal variability in ground water flow and quality. Monitoring may be scheduled to coordinate with the EMP or REMP, when determined by EPA to be appropriate.

6.4.1.3. Comparison of ground water quality data from locations within the trench on its up-gradient and down-gradient sides will be used to demonstrate capture of arsenic in the trench. Testing of hydraulic conductivity in the trench media will be used to evaluate the degree of fouling and the ability of the trench to fully treat all COCs. The ground water flow path will be verified through the use of potentiometric data from wells located up-gradient of, within, and down-gradient of the air-sparging trench.

6.4.1.4. Testing of the hydraulic conductivity changes in wells installed within the trench shall occur annually during operation of the air-sparging trench to evaluate possible fouling of the trench backfill material. Ground water samples collected up-gradient and down-gradient of each trench segment will be tested annually for parameters appropriate to evaluate the potential fouling of the native aquifer material up-gradient and down-gradient of the trench by the formation of precipitates that contain iron and arsenic. Solid matrix samples may also be collected down-gradient and up-gradient of the air-sparging trench annually to support evaluation of potential aquifer fouling. At a minimum, such sampling shall provide sufficient

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information to demonstrate that the precipitation of arsenic is occurring within the air-sparging trench and not in the surrounding aquifer.

#### 6.4.2. Remedy Performance Assessment

The Work Settling Defendants shall submit an AIR-SPARGING TRENCH REMEDY PERFORMANCE REPORT (the "Source Control Assessment") annually, based on the results of monitoring set forth in Section 6.4.1., herein, following a determination by EPA that the first trench segment is O&F. Using data from the PMWs, the annual Source Control Assessment shall describe how the air-sparging trench is reducing COC concentrations in ground water to ICLs and meeting Performance Standards. The annual Source Control Assessment shall also demonstrate the ability of the air-sparging trench to sequester arsenic in the trench. Following review, EPA may ask for additional data or data analysis to assess air-sparging trench performance and/or direct the Work Settling Defendants to install additional SC-PMWs to address evident data gaps.

The annual Source Control Assessment shall also include an evaluation of the operation and maintenance of the Source Area Remedial Action, discussion of the relevant points of the SCRA-O&M Plan with respect to the functioning remedy and an evaluation of the functional components of the remedy, including any potential for optimization. The annual Source Control Assessment shall also include an assessment of remedial efforts up-gradient of the Source Control remedy, in the landfill, that are acting to reduce or eliminate COCs within the landfill.

The optimization section of the annual Source Control Assessment, for both the Source Control remedy and any additional up-gradient source control remedial efforts, shall evaluate the current remedial system and recommend changes to either minimize costs, improve efficiency, or reduce operating time. The annual Source Control Assessment Optimization Section shall discuss the Site conceptual model and how the current system is reducing risk and how any changes may affect the Site conceptual model.

After air-sparging trench operations are shut-down, it must be demonstrated that precipitated arsenic within the trench will not re-mobilize. If chemical stability is not demonstrated by ground water quality monitoring or other methods determined by EPA to ensure proper characterization, media containing arsenic-precipitates will be removed from or stabilized within the trench through technologies proposed by the Work Settling Defendants and approved by EPA before a Certification of Completion of Work can be approved by EPA in accordance with Section 10.4., herein.

#### 6.5. Source Control Remedy Failure Trigger

In accordance with the 2004 AROD, a contingent cap remedy will be implemented in the event the air-sparging trench fails.

6.5.1. The 1991 ROD Source Control component (SC7/7A) shall be implemented if EPA determines that the Source Control remedy, including optimization efforts as described in

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Section 6.4., fails to attain Performance Standards for all COCs exiting the down-gradient side of the Source Control remedy, and the condition cannot be corrected through the optimization efforts within a reasonable time. The failure to attain Performance Standards or treat to ICLs shall be determined by EPA through a review of the Source Control Assessment Reports and the application of statistical tests acceptable to EPA that consider both the trend of COC concentrations over the monitoring period and the magnitude of contamination on the down-gradient side of the trench with respect to the ICL for each compound.

6.5.2. Additionally, if at any time, operation of the Source Control remedy creates conditions that EPA determines will increase or not decrease risk at the Site, such as air exposures or the creation of higher-risk daughter products, and those conditions are not corrected in what EPA determines to be a reasonable time, the 1991 ROD Source Control component (SC-7/7A) will be implemented. These conditions may include, but not be limited to, inability to manage concentrations of COCs entering the treatment zone that exceed the Source Control remedy's capacity, alteration of ground water flow directions or rates to a degree that impairs the effectiveness of the Source Control remedy, changes in ground water geochemistry that inhibit the ability to achieve remedial objectives, the production of recalcitrant daughter products that are not able to be treated or recovered by the Source Control remedy, and the creation of physical hazards.

## **7. SOUTHERN PLUME MANAGEMENT OF MIGRATION**

Ground water in the Southern Plume will be restored to meet ICLs established in the 2004 AROD, and ultimately the final cleanup levels, in a reasonable time, as determined by EPA, by extracting contaminated ground water, treating it on-site to reduce COC concentrations to ICLs and discharging it to the surrounding land in a manner and location that will not impair operation of the Southern Plume or Source Control remedies. Alternatively, the extracted ground water may be discharged to the Dover POTW for treatment, following pretreatment if necessary. Failure to demonstrate that COCs are no longer migrating towards the Bellamy Reservoir at concentrations above ICLs or that ground water will not be restored to meet ICLs in a reasonable time, as determined by EPA, shall require the Work Settling Defendants to undertake additional response actions to ensure the restoration of the ground water within the Southern Plume. The Work Settling Defendants shall conduct a Southern Plume Pump-and-Treat Pre-Design Investigation to design a system to control COC migration and restore ground water to ICLs, and ultimately the final cleanup levels. The Work Settling Defendants shall design, construct, operate, monitor, and maintain a ground water pump-and-treat remedy as outlined in Section X of the 1991 ROD and the 2004 AROD to restore ground water in the Southern Plume.

### **7.1 Southern Plume Management of Migration Pre-Design Investigation**

A Southern Plume PDI was completed in 1994. Since that time ground water has migrated and COC concentrations in several wells in the area of the Southern Plume have increased in the last three years. Based on monitoring information gathered since completion of the SEA Southern Plume PDI in 1994 and the Golder PDI in 1995, it is necessary to update the Southern Plume PDI. The goals of this new PDI are three-fold: first, determine the extent of ground water with

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COC concentrations above ICLs in the Southern Plume; second, determine the location of the ground water flow divide between the Eastern and Southern Plumes; and third, determine the location for a ground water extraction system and the nature of an *ex situ* treatment system.

The Work Settling Defendants have submitted to EPA a SOUTHERN PLUME PUMP-AND-TREAT PRE-DESIGN INVESTIGATION WORK PLAN (the “SP-PDI WP”) and begun implementation of the SP-PDI-WP to gather sufficient data to meet the goals of the PDI and to design and monitor the Southern Plume pump and treat system. The SP-PDI WP will result in a SOUTHERN PLUME PUMP-AND-TREAT PDI FINAL REPORT (the “Southern Plume PDI Report”) that outlines the parameters for designing the full-scale Southern Plume ground water remedy at the Site. This PDI shall be completed in accordance with the schedule in the Work Plan approved by EPA on June 15, 2006. The Southern Plume Phase I PDI Report, for field work performed in 2006, shall be submitted on or before June 15, 2007.

## **7.2 Southern Plume Management of Migration Remedial Design**

The Southern Plume Management of Migration Remedial Design (“SPRD”) shall consist of developing a full design to construct a ground water pump-and-treat remedy that will control migration of COCs in ground water towards the Bellamy Reservoir at concentrations above ICLs and restore the ground water to meet ICLs throughout the Southern Plume in a reasonable time, as determined by EPA. The extracted contaminated ground water will either be treated on-site to meet appropriate discharge standards to the ground surface or will be discharged to the Dover POTW for treatment.

### **7.2.1. Southern Plume Management of Migration Remedial Design Work Plan and Project Operations Plan**

Based on the results of the Southern Plume PDI Report, the Work Settling Defendants shall prepare and submit to EPA a SOUTHERN PLUME REMEDIAL DESIGN MANAGEMENT OF MIGRATION WORK PLAN (“SPRD-WP”) for conducting any Southern Plume Design activities including additional sample collection and analysis identified in the PDI.

The Work Settling Defendants shall submit the SPRD-WP within 30 days of EPA approval of the Final SP-PDI report. The SPRD-WP shall include, at a minimum, a detailed description of all activities to be undertaken in connection with the design and implementation of the pump-and-treat system. The detailed descriptions shall contain a statement of purpose and objectives, identification of the specific activities, and a detailed schedule for the implementation. The SPRD-WP shall designate the following submissions and supply a schedule for submitting the 30% and 100% Southern Plume Remedial Design documents and plans as set forth in this Section.

### **7.2.2. 30% and 60% Remedial Design Submissions**

Within 45 days of receiving EPA’s approval or modification of the SPRD-WP, the Work Settling Defendants shall submit to EPA the 30% Southern Plume Remedial Design submission. The 30% SPRD submission is a conceptual design that will contain, at a minimum, a summary of all

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Southern Plume PDI results, a summary of other relevant field investigations that may bear on the Southern Plume such as the Northwest Landfill PDI, a discussion of how ARARs are being met by the SPRD, the design criteria, the project delivery strategy, preliminary plans, drawings, sketches, and calculations, an outline of the required technical specifications and a preliminary construction schedule and costs including capital and O&M.

Within 60 days of receiving EPA's approval or modification of the 30% SPRD Submission, the Work Settling Defendants shall hold a progress meeting with EPA and NHDES to present the 60% SPRD and discuss the content of the 100% SPRD.

#### 7.2.3. 100% Remedial Design Submission

Within 120 days of receiving EPA's approval or modification of the 30% SPRD submission, the Work Settling Defendants shall submit the 100% Southern Plume Remedial Design. The 100% SPRD submission shall address all EPA comments to date, with responses, and shall contain, but not be limited to the following:

7.2.3.1. The final design plans and specifications in reproducible format.

7.2.3.2. Final bid documents.

7.2.3.3. A contingency plan that shall address the safety of on-site construction workers and the local affected population in the event of an accident or emergency.

7.2.3.4. A detailed schedule of activities to complete implementation of the entire Southern Plume Management of Migration remedy.

7.2.3.5. A constructability review that evaluates the suitability of the project and its components in relation to the Site.

7.2.3.6. A QA/QC check of the design plans with the technical specifications.

7.2.3.7. A detailed statement of how ARARs are met, and a statement of all assumptions and all drawings and specifications necessary to support the analysis of compliance with ARARs.

### **7.3 Southern Plume Management of Migration Remedial Action**

The Work Settling Defendants shall prepare the following documents and implement the following actions, based on the approved or modified 100% SPRD:

#### 7.3.1. Southern Plume Management of Migration Remedial Action Work Plan

The Remedial Action construction activities shall include, but are not limited to: development of a SOUTHERN PLUME MANAGEMENT OF MIGRATION REMEDIAL ACTION WORK PLAN ("SPRA-WP") and other actions that follow.

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Within 60 days of receiving EPA's approval or modification of the 100% SPRD, the Work Settling Defendants shall submit to EPA for review and approval or modification the SPRA-WP for implementing the approved or modified 100% Southern Plume Remedial Design. Included with the SPRA-WP shall be a CQAPP as outlined in Attachment 4 of the 1993 SOW.

#### 7.3.2. Pre-Construction Conference

Within 30 days of receiving EPA's approval or modification of the SPRA-WP, the Work Settling Defendants shall hold a SOUTHERN PLUME PRE-CONSTRUCTION CONFERENCE. The participants shall include all Work Settling Defendants and their representatives, EPA and the State.

#### 7.3.3. Initiation of Construction

Within 30 days of receiving EPA's approval or modification of the SPRA-WP, the Work Settling Defendants shall initiate all Southern Plume construction activities in accordance with the construction sequence and schedule contained therein.

#### 7.3.4. Meetings during Construction

During the construction period, the Work Settling Defendants and their construction contractor(s) shall meet with EPA and NHDES regarding progress and details of construction at least bi-weekly, or as otherwise agreed to by all parties.

#### 7.3.5. Operations and Maintenance Plan

Within 30 days following the 75% construction complete date, as described in the detailed schedule in the approved or modified SPRA-WP, the Work Settling Defendants shall submit to EPA for review and approval a SOUTHERN PLUME MANAGEMENT OF MIGRATION OPERATION AND MAINTENANCE PLAN ("SPRA-O&M Plan") to ensure the long-term, continued effectiveness of the Southern Plume pump-and-treat remedy. The SPRA-O&M Plan shall include, at a minimum, the following:

7.3.5.1. A description of normal operations and maintenance and inspection schedules.

7.3.5.2. A description of potential operational problems, and anticipated measures to detect and correct these problems.

7.3.5.3. A description of routine performance monitoring and analysis, which include the requirements in Section 7.4.

7.3.5.4. A description of methods and frequency of optimization of operation and monitoring, which include the requirements in Section 7.4.

7.3.5.5. An operational health and safety plan.

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7.3.5.6. Annual operation and maintenance budget projected over the lifetime of SPRA.

7.3.5.7. Record-keeping and reporting requirements.

7.3.5.8. In addition to the above, for monitoring wells, extraction wells, and any equipment that recovers contaminated ground water from the subsurface within the Southern Plume, the SPRA-O&M Plan shall also include, at a minimum, the following:

7.3.5.8.1. A provision for prompt and proper abandonment in accordance with State ARARs and, if needed, replacement, as required by EPA, of any wells or equipment that are unusable or that have become unusable during the SPRA-O&M activities.

7.3.5.8.2. A schedule for inspection, continued maintenance, and repair or replacement, if necessary, of all wells and subsurface recovery equipment associated with the Southern Plume remedy.

7.3.5.8.3. A schedule for continued assessment of the effectiveness of any well or subsurface extraction or monitoring equipment. Those wells or equipment that are no longer effective shall be proposed for abandonment as required in subparagraph 7.3.5.8.1. above.

7.3.5.8.4. A provision for the addition of new wells or equipment to assess any potential contaminant migration or obtain other hydrogeological information.

### 7.3.6. Final Construction Inspection

Within 45 days after the Work Settling Defendants conclude that the SPRA construction has been fully (100%) completed, the Work Settling Defendants shall schedule and conduct a Pre-Final Southern Plume Construction Inspection to identify any punch list items that need to be addressed before construction is completed. Within 75 days of the Pre-Final Inspection, the Work Settling Defendants shall schedule a Final Southern Plume Construction Inspection to determine completeness. Each inspection shall include all Work Settling Defendants and their representatives, EPA and NHDES.

### 7.3.7. Final Construction Report

Within 75 days of completion of the Pre-Final Southern Plume Construction Inspection, the Work Settling Defendants shall submit to EPA for review and approval the FINAL SOUTHERN PLUME REMEDIAL ACTION CONSTRUCTION REPORT, verifying that all punch-list items were addressed and that the Southern Plume Remedial Action is complete. The constructed Southern Plume Remedial Action is Operational and Functional (“O&F”) once EPA approves or modifies the Final Southern Plume Remedial Action Construction Report.

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## **7.4 Southern Plume Management of Migration Operation, Remedy Assessment, and Optimization**

Work Settling Defendants shall implement the Work detailed in the SPRA-O&M Plan upon approval or modification of the Final Southern Plume Remedial Action Construction Report. Effective operation, remedy assessment and optimization of performance are important to achieve the objectives of the Southern Plume Remedial Action (e.g., to control the migration of COCs at concentrations above ICLs towards the Bellamy Reservoir and restore the aquifer to meet ICLs, and ultimately the final cleanup levels, in a reasonable amount of time as determined by EPA). The key elements are described below:

### **7.4.1. Monitoring of Remedy Performance**

The method of monitoring and verification shall be developed using the results of the Southern Plume PDI. Remedy performance shall be determined through the following monitoring program.

7.4.1.1. Southern Plume Performance Monitoring Wells (“SP-PMWs”) will be installed to monitor the plume at locations that include areas up-gradient of the plume, within the plume, and at the down-gradient edge of the plume, the latter of which is defined to be areas or locations where the PDI identifies COC concentrations that meet ICLs. SP-PMWs will also be installed to monitor the lateral margins of the plume, with respect to the direction of ground water flow, as they are identified during the PDI. The objectives of the monitoring network design will be to monitor ground water flow and COC concentrations in the area of the Southern Plume to support evaluation of remedy performance and plume migration. Based upon currently available information, the SP-PMWs will likely be constructed as couplets or triplet wells with differing screen intervals in the wells that comprise the couplet or triplets to ensure adequate hydrogeologic and COC concentration monitoring.

7.4.1.2. Each SP-PMW shall be sampled at a frequency of once every three months after EPA determines the pump-and-treat remedy to be Operational and Functional and shall continue for one year, followed by sampling at a frequency of twice a year until EPA determines another monitoring frequency is appropriate to monitor seasonal variability in ground water flow and remedy performance. Monitoring may be scheduled to coordinate with the EMP or REMP, when determined by EPA to be appropriate.

### **7.4.2. Remedy Performance Assessment**

The Work Settling Defendants shall submit a SOUTHERN PLUME PUMP-AND-TREAT REMEDY PERFORMANCE REPORT (the “SP-P&T Assessment”) annually following a determination by EPA that the pump-and-treat remedy is O&F. Using data from the SP-PMWs, the SP-P&T Assessment will use trend analyses and other statistical methods approved or modified by EPA to evaluate changes in COC concentrations within and between monitoring wells and the performance of the pump-and-treat system relative to the remedy Performance

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Standards. Following review, EPA may ask for additional data or data analysis and/or require the Work Settling Defendants to install additional SP-PMWs to address evident data gaps.

The SP-P&T Assessment shall also include an evaluation of the operation and maintenance of the extraction, treatment and discharge system, discussing the relevant points of the SPRA-O&M Plan with respect to the functioning of the remedy and include an evaluation of the functional components of the remedy, including any potential for optimization. The optimization section shall evaluate the current remedial system in conjunction with other remedy components employed at the Site, and recommend changes to the SP-P&T system to either minimize costs, improve efficiency, or reduce operating time. The SP-P&T Assessment Optimization Section shall also discuss the Site conceptual model and how the current system is reducing risk and how any changes may affect the Site conceptual model or be required to address changes in the location of ground water contaminants.

## **8. EASTERN PLUME MANAGEMENT OF MIGRATION**

In the Eastern Plume, natural processes will restore ground water flowing to the Cocheco River to meet ICLs for site COCs through Monitored Natural Attenuation (“MNA”).<sup>7</sup> The ability of natural processes to restore ground water in the Eastern Plume is dependent upon the success of the 2004 AROD Source Control remedy to stop the flow of contaminants from the Waste Management Area.

### **8.1 Monitored Natural Attenuation Pre-Design Investigation**

The Work Settling Defendants shall submit an EASTERN PLUME MNA PRE-DESIGN INVESTIGATION WORK PLAN (the “EP-PDI-WP”) for conducting a Pre-Design Investigation that will gather sufficient data to produce the EASTERN PLUME MNA PDI FINAL REPORT (the “EP-MNA-PDI Final Report”). The EP-MNA-PDI Final Report will define the monitoring system and the parameters for monitoring the full-scale Eastern Plume MNA remedy at the Site. The EP-MNA-PDI Final Report shall be completed in accordance with the schedule approved or modified by EPA in the EP-PDI-WP.

### **8.2 MNA Implementation Work Plan**

The EP-MNA-PDI Final Report shall contain a description of the monitoring to be performed consistent with the MNA guidance<sup>8</sup> including the location and construction of monitoring wells to assess MNA, those wells described in Section 8.3.1., and a description of monitoring necessary to determine the progress of MNA in reducing the concentrations of COCs in the Eastern Plume ground water. The EP-MNA-PDI Final Report shall also describe the data and methods to be employed in assessing MNA progress and performance, as required by Section 8.3.2, including identifying statistical data analysis methods and MNA models to be used, if any.

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<sup>7</sup> *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites.* OSWER Directive 9200.4-17P, April 21, 1999.

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Work Settling Defendants shall implement the EP-MNA-PDI Final Report within 180 days after the Source Control remedy is O&F.

### **8.3 MNA Remedy Assessment and Optimization**

Remedy assessment is important to achieve the objectives of MNA for the Eastern Plume, which are to restore the aquifer to meet ICLs, and ultimately the final cleanup levels, in a reasonable amount of time as determined by EPA and prevent discharge of COCs to the Cocheco River above ICLs. The key elements of the MNA Remedy assessment are described below:

#### **8.3.1. Monitoring of Remedy Performance**

The method of monitoring and verifying the performance of MNA in the Eastern Plume will be measured, at a minimum, through the following monitoring program:

8.3.1.1. The Eastern Plume Performance Monitoring Wells (“EP-PMWs”) will initially consist of the existing monitoring network to the degree practicable to maximize the utility of the existing EMP database obtained over the last 10 years. The objectives of the monitoring network design will be to monitor ground water flow and COC concentrations in the area of the Eastern Plume to support evaluation of MNA performance and plume migration. Additional EP-PMWs shall be installed if EPA determines that such monitoring points are required to meet the requirements of EPA or NHDES guidance on MNA or if a significant data gap is found to exist. It should be noted that, based upon currently available information, any additional EP-PMWs will likely be constructed as couplets or triplet wells with differing screen intervals in the wells that comprise the couplet or triplets to ensure adequate hydrogeologic and COC concentration monitoring.

8.3.1.2. Each EP-PMW shall be sampled at a frequency of every six months once the EP-MNA PDI Final Report is approved or modified by EPA. Monitoring may be scheduled to coordinate with the EMP or REMP, when determined by EPA to be appropriate.

#### **8.3.2. Remedy Performance Assessment**

The Work Settling Defendants shall submit an EASTERN PLUME MNA REMEDY PERFORMANCE REPORT (the “EP-MNA Assessment”) annually, beginning one year after EPA approves or modifies the EP-MNA-RA-WP. The EP-MNA Assessment shall discuss the progress of MNA in the Eastern Plume using statistical methods and models approved or modified by EPA in the EP-MNA-RA-WP, describing the MNA processes occurring, the fate of COCs, and any confounding factors identified, compliance with EPA’s MNA guidance, the effect of other remedial actions and events at the Site, and how MNA is reducing COC concentrations in ground water to ICLs and meeting Performance Standards. Following review by EPA of each annual MNA Assessment, EPA may ask for additional data or data analysis and/or direct Work Settling Defendants to install additional PMWs to address evident data gaps.

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8.3.2.1. Five years after EPA determines that the Source Control remedy is O&F, the MNA remedy for the Eastern Plume will be assessed by EPA to determine if ground water cleanup has progressed sufficiently to indicate that ICLs (and ultimately the final cleanup levels) will be attained in a reasonable time-frame as determined by EPA.

8.3.2.2. Every five years, thereafter, the MNA remedy for the Eastern Plume will be assessed by EPA to determine if ground water cleanup has progressed sufficiently to indicate that ICLs (and ultimately the final cleanup levels) will be attained in a reasonable time-frame as determined by EPA.

#### **8.4. Eastern Plume MNA Remedy Failure Trigger**

EPA may require a pump-and-treat remedy for the restoration of ground water in the Eastern Plume if it determines, at any time, that the MNA remedy has failed. Failure of the MNA remedy for the Eastern Plume shall be defined as the inability of MNA to attain Performance Standards, ICLs, or the final cleanup levels, within a reasonable time. In this determination EPA will consider the results of the EP-MNA Assessments (e.g., trends in COC concentrations over the monitoring period, the areal extent of COCs at concentrations above ICLs in the Eastern Plume, and analyses of whether any ICL exceedances may have resulted from factors that do not equate with overall remedy failure), statistical tests, and models approved or modified by EPA. After determining the MNA remedy's failure to treat to ICLs, EPA may consider whether a more targeted supplemental response action that would achieve Performance Standards, *in lieu* of the contingent pump-and-treat remedy, would be appropriate.

### **9. CONTINGENT REMEDIES**

The 2004 AROD identified a RCRA C cap as the contingent remedy in the event of failure of the Source Control air-sparging trench remedy as defined in Section 6.5., herein. The 1991 ROD identified pump-and-treat of ground water in the Eastern Plume in the event of failure of MNA. Below are the requirements for implementing these contingent remedies in the event that EPA determines that either remedy has failed as outlined previously in Sections 6.5. and 8.4., both titled "Remedy Failure Trigger." Section 9.1.1., below, is required regardless of whether a contingent remedy is required or not.

#### **9.1 Source Control, 1996 Remedial Design**

##### **9.1.1. Design Update and Preparation**

Sixty (60) days after approval or modification of the Air-Sparging PDI Report by EPA, the Work Settling Defendants shall submit to EPA a letter report entitled 1996 SOURCE CONTROL REMEDIAL DESIGN UPDATE (the "SC RD Update") regarding the 100% Remedial Design for the 1996 Source Control remedy (the "1996 SC RD"), prepared by Golder Associates and submitted to EPA in December 1996. The Update shall contain an analysis of the 1996 SC RD regarding constructability, ability to meet Performance Standards, and compliance with ARARs. Upon receipt of EPA approval or modification of the 1996 SC RD Update letter report, the Work

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Settling Defendants shall revise the 1996 SC RD as needed, either with annotations on the existing plans or through correspondence. New, full plan sets are not required unless EPA determines that Source Control Contingent Remedy is required as described in Section 6.5., herein. The Work Settling Defendants shall submit a 1996 SC RD Update letter report every 18 months thereafter, until EPA determines that Section 9.1.2. has been triggered or until Certification of Completion of Work is issued under Section 10.4.

#### 9.1.2. Implementation of the Source Control Contingent Remedy

Thirty (30) days after EPA notifies the Work Settling Defendants in writing that the air-sparging trench has failed, the Work Settling Defendants shall submit a CONTINGENT SOURCE CONTROL REMEDIAL ACTION WORK PLAN (the “1996 SC RA WP”) that includes a schedule of all activities to implement the 1996 SC RD as updated in Section 9.1.1., above. The Work Settling Defendants shall comply with Section H of the 1993 SOW in implementing the Contingent Remedy.

The 1996 SC RA WP and implementation of the 1996 SC RA construction activities, including the O&M, shall be performed as outlined in the 1991 ROD and 1993 Consent Decree as modified by the 1996 SC RD and any approved or modified 1996 SC RD Updates.

### 9.2 Eastern Plume Management of Migration Contingent Remedy, Pump-and-Treat

Thirty (30) days after EPA notifies, in writing, the Work Settling Defendants that the Eastern Plume MNA remedy has failed, in accordance with Section 8.4., or if the entire Source Control remedy is not implemented and O&F by October 2010 and EPA so directs, the Work Settling Defendants shall meet the Performance Standards contained in Section 4.1.1., herein, and perform the tasks described in this Section:

#### 9.2.1. Eastern Plume Management of Migration Contingent Remedy Pre-Design Investigation

Significant amounts of ground water and geotechnical data have been collected in the Eastern Plume since 1983. Other, proximal PDIs will provide additional information to design an Eastern Plume PDI. The goals of this new PDI, if necessary, would be three-fold: first, determine the extent of ground water with COC concentrations above ICLs; second, determine hydraulic and geochemical conditions that are extant; and third, determine the location for a ground water extraction system and the nature of an *ex situ* treatment system.

The Work Settling Defendants shall submit to EPA an EASTERN PLUME PUMP-AND-TREAT PRE-DESIGN INVESTIGATION WORK PLAN (the “EP-PDI WP”) within 30 days after receipt of EPA’s written notification identified in Section 9.2., above. Implementation of the EP-PDI WP will gather sufficient data to meet the goals of the PDI and to design and monitor the Eastern Plume pump and treat system. The EP-PDI WP will result in an EASTERN PLUME PUMP-AND-TREAT PDI FINAL REPORT (the “Eastern Plume PDI Report”) that outlines the parameters for designing the full-scale Eastern Plume ground water remedy at the Site. This PDI shall be completed in accordance with the schedule in the Work Plan approved or modified by EPA

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### 9.2.2. Eastern Plume Management of Migration Remedial Design

The Eastern Plume Management of Migration Remedial Design (“EPRD”) shall consist of developing a full design, based on the Eastern Plume PDI Report approved or modified by EPA, to construct a ground water pump-and-treat remedy that will restore the ground water to ICLs throughout the Eastern Plume in a reasonable time, as determined by EPA. The extracted contaminated ground water will either be treated on-site to meet appropriate standards for discharge to the ground surface or will be discharged to the Dover POTW for treatment.

#### 9.2.2.1. Eastern Plume Management of Migration Remedial Design Work Plan and Project Operations Plan

Based on the results of the Eastern Plume PDI Report, the Work Settling Defendants shall prepare and submit to EPA a EASTERN PLUME REMEDIAL DESIGN MANAGEMENT OF MIGRATION WORK PLAN (“EPRD-WP”) for conducting any Eastern Plume Design activities including additional sample collection and analysis identified in the PDI.

The Work Settling Defendants shall submit the EPRD-WP based on the schedule in the Eastern Plume PDI Report. The EPRD-WP shall include, at a minimum, a detailed description of all activities to be undertaken in connection with the design and implementation of the pump-and-treat system. The detailed descriptions shall contain a statement of purpose and objectives, identification of the specific activities, and a detailed schedule for the implementation. The EPRD-WP shall designate the following submissions and supply a schedule for submitting the 30% and 100% Eastern Plume Remedial Design documents and plans as set forth in this Section.

#### 9.2.2.2. 30% and 60% Remedial Design Submissions

Within 45 days of receiving EPA’s approval or modification of the EPRD-WP, the Work Settling Defendants shall submit to EPA the 30% Eastern Plume Remedial Design submission. The 30% EPRD submission is a conceptual design that will contain, at a minimum, a summary of all Eastern Plume PDI results, a summary of other information obtained from relevant field investigations that may bear on the Eastern Plume, a discussion of how ARARs are being met by the EPRD, the design criteria, the project delivery strategy, preliminary plans, drawings, sketches, and calculations, an outline of the required technical specifications and a preliminary construction schedule and costs including capital and O&M.

Within 60 days of receiving EPA’s approval or modification of the 30% EPRD Submission, the Work Settling Defendants shall hold a progress meeting with EPA and NHDES to present the 60% EPRD and discuss the content of the 100% EPRD.

#### 9.2.2.3. 100% Remedial Design Submission

Within 120 days of receiving EPA’s approval of the 30% EPRD submission, the Work Settling Defendants shall submit the 100% Eastern Plume Remedial Design. The 100% EPRD

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submission shall address all EPA comments to date, with responses, and shall contain, but not be limited to the following:

9.2.2.3.1. The final design plans and specifications in reproducible format.

9.2.2.3.2. Final bid documents.

9.2.2.3.3. A contingency plan that shall address the safety of on-site construction workers and the local affected population in the event of an accident or emergency.

9.2.2.3.4. A detailed schedule of activities to complete implementation of the entire Eastern Plume Management of Migration remedy.

9.2.2.3.5. A constructability review that evaluates the suitability of the project and its components in relation to the Site.

9.2.2.3.6. A QA/QC check of the design plans with the technical specifications.

9.2.2.3.7. A detailed statement of how ARARs are met, and a statement of all assumptions and all drawings and specifications necessary to support the analysis of compliance with ARARs.

9.2.3. Eastern Plume Management of Migration Remedial Action

The Work Settling Defendants shall prepare the following documents and implement the following actions, based on the approved or modified 100% EPRD:

9.2.3.1. Eastern Plume Management of Migration Remedial Action Work Plan

The Remedial Action construction activities shall include, but are not limited to: development of a EASTERN PLUME MANAGEMENT OF MIGRATION REMEDIAL ACTION WORK PLAN ("EPRA-WP") and other actions that follow.

Within 60 days of receiving EPA's approval of the 100% EPRD, the Work Settling Defendants shall submit to EPA for review and approval or modification the EPRA-WP for implementing the approved or modified Eastern Plume Remedial Design. Included with the EPRA-WP shall be a CQAPP as outlined in Attachment 4 of the 1993 SOW.

9.2.3.2. Pre-Construction Conference

Within 30 days of receiving EPA's approval or modification of the EPRA-WP, the Work Settling Defendants shall hold a EASTERN PLUME PRE-CONSTRUCTION CONFERENCE. The participants shall include all Work Settling Defendants and their representatives, EPA and the State.

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#### 9.2.3.3. Initiation of Construction

Within 30 days of receiving EPA's approval or modification of the EPRA-WP, the Work Settling Defendants shall initiate all Eastern Plume construction activities in accordance with the construction sequence and schedule contained therein.

#### 9.2.3.4. Meetings During Construction

During the construction period, the Work Settling Defendants and their construction contractor(s) shall meet at least bi-weekly, or as otherwise agreed to by all parties, with EPA and NHDES regarding progress and details of construction.

#### 9.2.3.5. Operations and Maintenance Plan

Within 30 days following the 75% construction complete date, as described in the detailed schedule in the approved or modified EPRA-WP, the Work Settling Defendants shall submit to EPA for review and approval a EASTERN PLUME MANAGEMENT OF MIGRATION OPERATION AND MAINTENANCE PLAN ("EPRA-O&M Plan") to ensure the long-term, continued effectiveness of the Eastern Plume pump-and-treat remedy. The EPRA-O&M Plan shall include, at a minimum, the following:

9.2.3.5.1. A description of normal operations and maintenance and inspection schedules.

9.2.3.5.2. A description of potential operational problems, and anticipated measures to detect and correct these problems.

9.2.3.5.3. A description of routine performance monitoring and analysis, which include the requirements in Section 7.4.

9.2.3.5.4. A description of methods and frequency of optimization of operation and monitoring, which include the requirements in Section 7.4.

9.2.3.5.5. An operational health and safety plan.

9.2.3.5.6. Annual operation and maintenance budget projected over the lifetime of EPRA.

9.2.3.5.7. Record-keeping and reporting requirements.

9.2.3.5.8. In addition to the above, for monitoring wells, extraction wells, and any equipment that recovers contaminated ground water from the subsurface within the Eastern Plume, the EPRA-O&M Plan shall also include, at a minimum, the following:

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9.2.3.5.8.a. A provision for prompt and proper abandonment in accordance with State ARARs and, if needed, replacement, as required by EPA, of any wells or equipment that are unusable or that have become unusable during the EPRA-O&M activities.

9.2.3.5.8.b. A schedule for inspection, continued maintenance, and repair or replacement, if necessary, of all wells and subsurface recovery equipment associated with the Eastern Plume remedy.

9.2.3.5.8.c. A schedule for continued assessment of the effectiveness of any well or subsurface extraction or monitoring equipment. Those wells or equipment that are no longer effective shall be proposed for abandonment as required in subparagraph 9.2.3.5.8.a. above.

9.2.3.5.8.d. A provision for the addition of new wells or equipment to assess any potential contaminant migration or obtain other hydrogeological information.

#### 9.2.3.6. Final Construction Inspection

Within 30 days after the Work Settling Defendants conclude that the EPRA construction has been fully (100%) completed, the Work Settling Defendants shall schedule and conduct a PRE-FINAL EASTERN PLUME CONSTRUCTION INSPECTION to identify any punch list items that need to be addressed before construction is completed. This inspection shall include all Work Settling Defendants and their representatives, EPA and NHDES.

#### 9.2.3.7. Final Construction Report

Within 60 days of completion of the Pre-Final Eastern Plume Construction Inspection, the Work Settling Defendants shall submit to EPA for review and approval the FINAL EASTERN PLUME REMEDIAL ACTION CONSTRUCTION REPORT, verifying that all punch-list items were addressed and that the Eastern Plume Remedial Action is complete. The constructed Eastern Plume Remedial Action is Operational and Functional ("O&F") when EPA approves or modifies the Final Eastern Plume Remedial Action Construction Report.

#### 9.2.4. Eastern Plume Management of Migration Operation, Remedy Assessment, and Optimization

Work Settling Defendants shall implement the Work detailed in the EPRA-O&M Plan upon approval or modification of the Final Eastern Plume Remedial Action Construction Report. Effective operation, remedy assessment and optimization of performance are important to achieve the objectives of the Eastern Plume Remedial Action to restore the aquifer to meet ICLs, and ultimately the final cleanup levels, in a reasonable amount of time as determined by EPA. The key elements are described below:

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#### 9.2.4.1. Monitoring of Remedy Performance

The method of monitoring and verification shall be developed using the results of the Eastern Plume PDI. COC concentrations shall be determined through the following monitoring program.

9.2.4.1.1. Eastern Plume Performance Monitoring Wells (“EP-PMWs”) will be installed to monitor the performance of the remedy. EP-PMWs will also be installed to monitor the lateral margins of the plume, with respect to the direction of ground water flow, as they are identified during the PDI. The objectives of the monitoring network design will be to monitor ground water flow and COC concentrations in the area of the Eastern Plume to support evaluation of remedy performance and plume migration. Based upon currently available information, the EP-PMWs will likely be constructed as couplets or triplet wells with differing screen intervals in the wells that comprise the couplet or triplets to ensure adequate hydrogeologic and COC concentration monitoring.

9.2.4.1.2. Each EP-PMW shall be sampled at a frequency of once every six months after EPA determines the pump-and-treat remedy to be Operational and Functional. Monitoring may be scheduled to coordinate with the EMP or REMP, when determined by EPA to be appropriate.

#### 9.2.4.2. Remedy Performance Assessment

The Work Settling Defendants shall submit an EASTERN PLUME PUMP-AND-TREAT REMEDY PERFORMANCE REPORT (the “EP-P&T Assessment”) annually following a determination by EPA that the pump-and-treat remedy is O&F. Using data from the EP-PMWs, the EP-P&T Assessment will use trend analyses and other statistical methods approved by EPA to evaluate changes in COC concentrations within and between monitoring wells and the performance of the pump-and-treat system relative to the remedy Performance Standards. Following review, EPA may ask for additional data or data analysis and/or require the Work Settling Defendants to install additional EP-PMWs to address evident data gaps.

The EP-P&T Assessment shall also include an evaluation of the operation and maintenance of the extraction, treatment and discharge system, discussing the relevant points of the SPRA-O&M Plan with respect to the functioning of the remedy and include an evaluation of the functional components of the remedy, including any potential for optimization. The Optimization section shall evaluate the current remedial system in conjunction with other remedy components employed at the Site, and recommend changes to the EP-P&T system to either minimize costs, improve efficiency, or reduce operating time. The EP-P&T Assessment Optimization Section shall also discuss the Site conceptual model and how the current system is reducing risk and how any changes may affect the Site conceptual model.

### 10. SITE CLOSEOUT

Once all remedial actions have been completed, and at least one 5-year review has been conducted, if the Work Settling Defendants believe that all ICLs (and ultimately the final

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cleanup levels) have been attained, Performance Standards have been met, and both will be maintained, and that O&M is no longer necessary, the Work Settling Defendants may submit to EPA a DEMONSTRATION OF COMPLIANCE PLAN (“DCP”) to provide data necessary for EPA to determine that all ICLs (and ultimately the final cleanup levels) have been attained and Performance Standards have been met, and both will be maintained, and that O&M is no longer necessary. Once EPA approves or modifies the DCP, the Work Settling Defendants shall submit a DEMONSTRATION OF COMPLIANCE REPORT (“DCR”) that follows the outlines of the DCP. The DCR should provide the data and evidence sufficient to determine that ICLs (and ultimately the final cleanup levels) have been attained and Performance Standards have been met, and both will be maintained, and that O&M is no longer necessary. Upon approval or modification of the DCR, the Work Settling Defendants shall submit to EPA a Remedial Action Demobilization Work Plan (the “RAD-WP”) to outline necessary activities to demobilize all Remedial Action activities at the Site. Following EPA approval or modification of completion of the implementation of the RAD-WP, EPA will issue a Certificate of Completion of Work, as described in Section 10.4., below.

### **10.1 Demonstration of Compliance Plan**

The Work Settling Defendants shall submit a Demonstration of Compliance Plan to EPA. The Demonstration of Compliance Plan shall describe in detail all activities that will be conducted to:

10.1.1. Demonstrate compliance with all Performance Standards, and all applicable or relevant and appropriate requirements (“ARARs”) including;

- Specify the citation of the ARAR.
- Identify if the ARAR is state or federal.
- Summarize the requirements of the ARAR.
- Specify in detail all activities that will be conducted to demonstrate compliance with the ARAR.

10.1.2. Demonstrate that all activities have been completed in accordance with design/construction criteria

10.1.3. Provide adequate monitoring, data collection and analysis, and reporting to assure protectiveness and that O&M is no longer necessary and to support post-closure human health and ecological risk assessments; and

10.1.4. When sampling and analysis is required to demonstrate compliance or to support post-closure human health and ecological risk assessments, the Demonstration of Compliance Plan shall be developed in accordance with the requirements of the Agency’s guidance and policies for Monitored Natural Attenuation, Indoor Air, Ground Water Pump-and-Treat, Landfill Clean Closure, and 40 C.F.R. § 264.97, and shall specify:

10.1.4.1. Sampling locations.

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10.1.4.2. Sampling frequency.

10.1.4.3. Sampling methods.

10.1.4.4. List of analytes and analytical methods.

10.1.4.5. Data and standard operating procedures for quality assurance and quality control measures.

10.1.4.6. Statistical analysis and/or modeling and/or other data interpretation techniques consistent with EPA guidance and policies.

10.1.5. Provide for monitoring and assuring landfill cover integrity over time and complying with State closure standards.

10.1.6. Demonstrate that landfill gas concentrations, ground water, surface waters and sediments down-gradient of the landfill are sustained at levels protective of human health and the environment once all active and passive treatment systems are discontinued.

## **10.2 Demonstration of Compliance Report**

Consistent with the schedule established in the DCP, the Work Settling Defendants shall submit the Demonstration of Compliance Report (the “DCR”) (or its modifications as discussed below) which shall contain the information identified in Section 10.1. of this 2007 SOW to demonstrate compliance. The DCR shall also contain:

10.2.1. A detailed summary of the Remedial Design and Remedial Action activities undertaken;

10.2.2. Documentation of all sampling locations, analytical methods and results; the basis for determining that the Performance Standards (including those for ground water and surface water) have been met; QA/QC documentation of these results; the location and frequency of tests and comparison of test results with the Performance Standards in a tabular form, and otherwise provide attenuation trends, modeling or other data in support of the findings.

10.2.3. A human health and ecological risk assessment and all data and quality assurance/quality control requirements that support the human health and ecological risk assessments. The risk assessment of the residual ground water contamination will assess the cumulative risks posed to current and potential future receptors for carcinogens and non-carcinogens through the consumption of Site ground water. The risk assessment will follow EPA Region 1 guidelines and use site-specific values, reviewed and accepted by EPA, as inputs for the various exposure parameters.

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### **10.3 Remedial Action Demobilization**

The Work Settling Defendants shall develop and submit to EPA a REMEDIAL ACTION DEMOBILIZATION WORK PLAN (the "RAD-WP") to describe necessary activities to demobilize the Remedial Action activities. The RAD-WP shall be submitted within 30 days of the date that the DCR is approved or modified by EPA and will result in a Remedial Action Demobilization Final Report (the "RAD Final Report") that outlines the completion of the tasks in the approved or modified RAD-WP. The RAD-WP shall contain the following components:

10.3.1. A description of the techniques for stabilization or removal of COCs present in the air-sparging trench media that may otherwise be remobilized and cause ground water conditions to create an unacceptable risk to human health or the environment.

10.3.2. A description of all the extraction, treatment, and monitoring apparatuses at the Site that will be removed and that will remain.

10.3.3. An evaluation of all areas of wetland/floodplain restoration sufficient to determine that Performance Standards outlined in Section 4 for restoration have been attained.

### **10.4 Certification of Completion of Work**

Upon review of the Demonstration of Compliance Report if EPA determines that all ICLs have not been attained or that the Performance Standards have not been achieved, EPA shall notify the Work Settling Defendants of its disapproval of the Demonstration of Compliance Report. The Work Settling Defendants shall then perform those activities necessary to correct deficiencies and resubmit the Demonstration of Compliance Report to EPA for approval, according to a schedule set forth, approved or modified by EPA.

If EPA, based on the risk assessments and all other information contained in the DCR, determines that the risks are within EPA's risk management standard for carcinogens and non-carcinogens for ground water, the ICLs will be deemed protective and will become the final cleanup levels for the Site. If EPA finds that the ICLs are not protective of human health or the environment after a risk assessment has been performed, EPA will establish new, final cleanup levels. EPA, based on the determination that ICLs or final cleanup levels have been attained at the site and a determination that the RAD Final Report is adequate, will then issue a Certification of Completion of Work to the Work Settling Defendants.

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**Attachment A - Requirements for Project Operations Plans**

Before any field activities commence on the Site, the Work Settling Defendants shall submit several site-specific plans to establish procedures to be followed by the Work Settling Defendants in performing field, laboratory, and analysis work. These site-specific plans include the:

1. SITE MANAGEMENT PLAN (“SMP”)
2. Sampling and Analysis Plan (“SAP”), not a separate document, but comprised of:
  - 2a. QUALITY ASSURANCE PROJECT PLAN (“QAPP”)
  - 2b. FIELD SAMPLING PLAN (“FSP”)
3. HEALTH AND SAFETY PLAN (“HASP”)

These four volumes form the Site Project Operations Plan (“POP”). The four components of the POP are described in Sections 1 through 3, herein.

The format and scope of each Plan shall be modified as needed to describe the sampling, analyses, and other activities that are clarified as each PDI is implemented and as the RD/RA progresses. EPA may modify the scopes of these activities at any time during the PDI or RD/RA at the discretion of EPA in response to the evaluation of PDI or RD/RA results, changes in PDI or RD/RA requirements, and other developments or circumstances.

There is substantial overlap in the content of the POP elements for the PDIs, RD, and RA. Accordingly, the Work Settling Defendants will prepare an SMP, a HASP, and a QAPP that will apply to all the PDI, RD, and RA activities. Aspects of these plans that are unique to specific PDIs or RD/RA elements will be discussed in the Work Plans for those PDIs and RD/RA elements. Also, the FSPs will be described in the PDI and RD/RA Work Plans because they will be unique and specific to the objectives of the individual Work Plans. When approved or modified by EPA, the SMP, HASP, QAPP, and Work Plans will control in the event of conflicts between their content and the requirements of this Attachment A to the 2007 SOW.

**1. SITE MANAGEMENT PLAN (“SMP”)**

The Site Management Plan (“SMP”) shall describe how the Work Settling Defendants shall manage the project to complete the Work required at the Site. The overall objective of the Site Management Plan is to provide EPA and NHDES with a written understanding and commitment of how access, security, contingency procedures, management responsibilities, waste disposal, budgeting, and data handling are being managed by the Work Settling Defendants. The Site Management Plan shall:

1. Provide a map and list of properties, the property owners, and addresses of owners to whose property access may be required.

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2. Clearly indicate the exclusion zone, contamination reduction zone, and clean area for on-site activities (may be addressed in individual PDI and RD/RA Work Plans).
3. Establish necessary procedures and provide sample letters to land owners to arrange field activities and to ensure EPA is aware of access-related problems and issues.
4. Provide for the security of government and private property on the Site.
5. Prevent unauthorized entry to the Site, which might result in exposure of persons to potentially hazardous conditions.
6. Establish the location of a field office for on-site activities. The location and types of supporting documents for each element of Work shall be listed (HASP, FSP, etc.).
7. Provide contingency and notification plans for potentially dangerous activities associated with the PDIs and RD/RA.
8. Monitor airborne contaminants released by Site activities which may affect the local populations.
9. Describe how all Work areas will be maintained and restored to meet all performance standards (may be addressed in individual PDI and RD/RA Work Plans). Restored areas shall have native vegetation established and not allow erosion.
10. Communicate to EPA, NHDES, and the public the organization and management of the PDIs and RD/RA, including key personnel and their responsibilities.
11. Provide a list of contractors and subcontractors of the Work Settling Defendants in the PDI and RD/RA activities and description of their activities and roles (may be addressed in individual PDI and RD/RA Work Plans).
12. Provide regular financial reports of the Work Settling Defendants expenditures on the PDI and RD/RA activities.
13. Provide for the proper disposal of materials used and wastes generated during the PDI and RD/RA (e.g., drill cutting, extracted ground water, protective clothing, disposable equipment). These provisions shall be consistent with the off-site disposal aspects of CERCLA, RCRA, and applicable state laws. The Work Settling Defendants, or their authorized representative, or another party acceptable to EPA and NHDES shall be identified as the generator of wastes for the purpose of regulatory or policy compliance.
14. Provide plans and procedures for organizing, manipulating, and presenting the data generated and for verifying its quality before and during the PDIs and RD/RA. These

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plans shall include the description of the proposed computer data management system which shall be compatible with hardware and software available to EPA Region I and NHDES personnel for handling media-specific sampling results obtained before and during the PDIs and RD/RA. The description shall include data to be managed, appropriate quality assurance/quality control to ensure accuracy, and capabilities of data manipulation. The data management system shall be compatible with the current EPA Region I and NHDES data storage and analysis systems.

## **2. SAMPLING AND ANALYSIS PLAN (“SAP”)**

The SAP shall be consistent with Section VIII of the Amended Consent Decree; SAP(s) that are approved by EPA will be deemed to comply with Section VIII of the Amended Consent Decree. The SAP is not a single document but instead consists of the following two separate volumes:

- (1) a Quality Assurance Project Plan (“QAPP”) that describes the policy, organization, functional activities, and the quality assurance and quality control protocols necessary to achieve the data quality objectives dictated by the intended use of the data; and
- (2) the Field Sampling Plan (“FSP”) that provides guidance for all fieldwork by defining in detail the sampling and data-gathering methods to be used on a project.

The first SAP, presented in the Work Plan, shall be the framework of all anticipated field activities (e.g., sampling objectives, evaluation of existing data, standard operating procedures) and contain specific information on the initial field work (e.g., sampling locations and rationale, sample numbers and rationale, analyses of samples). During the PDIs and RD/RA, the SAP shall be revised as necessary to cover subsequent field or laboratory activities. The purpose of the SAP is to ensure that sampling data collection activities will be comparable to and compatible with previous data collection activities performed at the Site while providing a mechanism for planning and approving field activities. The overall objectives of the two documents comprising the SAP are as follows:

1. to document specific objectives, procedures, and rationales for fieldwork and sample analytical work;
2. to provide a mechanism for planning and approving Site and laboratory activities;
3. to ensure that sampling and analysis activities are necessary and sufficient; and
4. to provide a common point of reference for all Work Settling Defendants to ensure the comparability and compatibility of all objectives and the sampling and analysis activities.

To achieve this last objective, the SAP shall document all field and sampling and analysis objectives as noted above, as well as all data quality objectives and specific procedures/protocols for field sampling and analysis.

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The following critical elements of the SAP shall be described for each sample medium (e.g., ground water, surface water, soil, sediment, air, and biota) and for each sampling event:

1. sampling objectives;
2. data quality objectives, including data uses and the rationale for the selection of analytical levels and detection limits (see Guidance for the Data Quality Objectives Process, EPA QA/G-4 (EPA/600/r-96/055, September 1994); Draft Data Quality Objectives Decision Errors Feasibility Trials (DEFT) Software, EPA/600/R-96/056, September 1994; Final Guidance Data Usability in Risk Assessment (Part A) (publication 9285.7-09A, April 1992, PB92-963356); and Guidance for Data Usability in Risk Assessment (Part B) (publication 9285.7-09B, May 1992, PB92-963362));
3. site background update, including an evaluation of the validity, sufficiency, and sensitivity of existing data;
4. sampling locations and rationale;
5. sampling procedures and rationale and references;
6. numbers of samples and justification;
7. numbers of field blanks, trip blanks, and duplicates;
8. sample media (e.g., ground water, surface water, soil, sediment, air, and buildings, facilities, and structures, including surfaces, structural materials, and residues);
9. sample equipment, containers, minimum sample quantities, sample preservation techniques, maximum holding times;
10. instrumentation and procedures for the calibration and use of portable air, soil-, or water-monitoring equipment to be used in the field;
11. chemical and physical parameters in the analysis of each sample;
12. chain-of-custody procedures (see EPA NEIC Policies and Procedures Manual, EPA 330/9-78 001-R May 1978, revised May 1986);
13. procedures to eliminate cross-contamination of samples (such as dedicated equipment);
14. laboratory analytical procedures, equipment, and detection limits;
15. equipment decontamination procedures;

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16. analysis from each medium for all inorganic and organic COCs;
17. analysis for other site-specific constituents in each media as required for design or monitoring of treatment systems and their performance; and
19. for any limited field investigation (field screening technique), provisions for the collection and laboratory analysis of duplicate samples and for the quantitative correlation analysis in which screening results are compared with laboratory results.

The SAP must be the framework of all anticipated field activities (e.g., sampling objectives, evaluation of existing data, standard operating procedures) and contain specific information on each round of field sampling and analysis work (e.g., sampling locations and rationale, sample numbers and rationale, analyses of samples). During the PDIs and RD/RA, the SAP shall be revised as necessary to cover subsequent field or laboratory activities. Revisions or a statement regarding the need for revisions shall be included in each deliverable describing all new field work.

The SAP shall allow for notifying EPA, at a minimum, three weeks before field sampling or monitoring activities commence. The SAP shall also allow split, replicate, or duplicate samples to be taken by EPA (or their contractor personnel) and by other Work Settling Defendants approved by EPA. At the request of EPA the Work Settling Defendants shall provide these samples in appropriately pre-cleaned containers to the government representatives. Identical procedures shall be used to collect the Work Settling Defendants and the duplicate split samples.

Several references shall be used to develop the SAP, for example:

- Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (OSWER Directive 9355.3-01, EPA/540/G-89/004, October 1988);
- Test Methods for Evaluating Solid Waste, Physical/Chemical Method (EPA Pub. SW-846, Third Edition, most recent update);
- EPA Requirements for Quality Assurance Plans, EPA QA/R-5 (EPA/240/B-01/003), March 2001;
- Region I, EPA-New England Compendium of Quality Assurance Project Plan Requirements and Guidance (U.S. EPA-New England Region I Quality Assurance Unit Staff, Office of Environmental Measurement and Evaluation; October 1999 Final);
- Guidance for the Data Quality Objectives Process, EPA QA/G-4 (EPA/600/r-96/055, September 1994);
- Draft Data Quality Objectives Decision Errors Feasibility Trials (DEFT) Software, EPA/600/R-96/056, September 1994;

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- Guidance for the Data Quality Objectives Process for Hazardous Waste, EPA QA/G-4HW Draft;
- Guidance for Preparing Standard Operating Procedures(SOPs), EPA QA/G-6 (EPA/240/B-01/004), March 2001;
- Region I, EPA-New England Data Validation Functional Guidelines for Evaluating Environmental Analyses, Revised December 1996; and
- Guidance for Data Quality Assessment: Practical Methods for Data Analysis, EPA QA/G-9 (EPA/600/R-96-084, QA 97 Version, January 1998).

## **2.1 QUALITY ASSURANCE PROJECT PLAN (“QAPP”)**

The Quality Assurance Project Plan (“QAPP”) shall document in writing the site-specific objectives, policies, organizations, functional activities, sampling and analysis methods and specific quality assurance/quality control activities designed to achieve the data quality objectives (“DQOs”) of the PDIs and RD/RA. The QAPP developed for this project shall document quality control and quality assurance policies, procedures, routines, and specifications.

Project activities throughout the PDIs and RD/RA shall comply with the QAPP. QAPP sampling and analysis objectives and procedures shall be consistent with EPA Requirements QAPP for Environmental Data Operations (EPA QA/R-5) and appropriate EPA handbooks, manuals, and guidelines including Region I, EPA-New England Compendium of Quality Assurance Project Plan Requirements and Guidance (October 1999 Final) ( the “Compendium”), Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (EPA Pub. SW-846, Third Edition, latest update), Guidelines Establishing Test Procedures for the Analysis of Pollutants (40 C.F.R. Part 136), and Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air (EPA-600/4-84-041 April 1984).

All the QAPP elements identified in EPA QA/R-5 and the “Compendium” must be addressed.

As indicated in EPA QA/R-5 and the “Compendium”, a list of essential elements must be considered in the QAPP for the PDIs and RD/RA. If a particular element is not relevant to a project and therefore excluded from the QAPP, specific and detailed reasons for exclusion must be provided.

Information in a plan other than the QAPP may be cross-referenced clearly in the QAPP provided that all objectives, procedures, and rationales in the documents are consistent, and the reference material fulfills requirements of EPA/QA/R-5. Examples of how this cross reference might be accomplished can be found in the Guidance for the Data Quality Objectives Process (EPA/600/R-96/055) and the Data Quality Objectives Decision Errors Feasibility Trials (DEFT) Software (EPA/600/R-96/056). EPA-approved references, or equivalent, or alternative methods

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approved by EPA shall be used, and their corresponding EPA-approved guidelines should be applied when they are available and applicable.

Laboratory QA/QC Procedures

The QA/QC procedures and SOPs for any laboratory (both fixed and mobile) used during the PDIs and RD/RA shall be included in the Work Settling Defendants' QAPP. When this work is performed by a contractor to a private party, each laboratory performing chemical analyses shall meet the following requirements:

- 1) be approved by the State Laboratory Evaluation Program, if available;
- 2) have successful performance in one of EPA's National Proficiency Sample Programs (i.e., Water Supply or Water Pollution Studies or the State's proficiency sampling program);
- 3) be familiar with the requirements of 48 C.F.R. Part 1546 contract requirements for quality assurance; and
- 4) have a QAPP for the laboratory including all relevant analyses, which shall be referenced as part of the contractor's QAPP.

Data Validation Procedures

The Work Settling Defendants are required to certify that a representative portion of the data has been validated by a person independent of the laboratory according to the Region I, EPA-New England Data Validation Functional Guidelines for Evaluating Environmental Analyses, revised December 1996, amended as necessary to account for the differences between the approved analytical methods for the project and the current Contract Laboratory Program Statements of Work ("CLP SOW"). A data validation reporting package as described in the guidelines cited above must be delivered at the request of the EPA project manager. Approved validation methods shall be described in the QAPP.

The independent validator shall not be the laboratory conducting the analysis and should be a person with a working knowledge of or prior experience with EPA data validation procedures. The independent validator shall certify that the data has been validated, discrepancies have been resolved, if possible, and appropriate data qualifiers noted.

Data Package Requirements:

The Work Settling Defendants must require and keep the complete data package and make it available to EPA on request in order for EPA to conduct an independent validation of the data. The complete data package shall consist of all results, the raw data, and all relevant QA/QC information. The forms contained in the data validation functional guidelines must be utilized

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to report the data when applicable. Raw data are to be retained by the laboratory performing the analysis and include the associated chromatograms and the instrument printouts with area and height peak results. The peaks in all standards and samples must be labeled. The concentration of all standards analyzed with the amount injected must be included. All laboratory tracking information must also be included in the data package. An example data package deliverable is listed below:

- 1) a summary of positive results and detection limits of non-detects with all raw data;
- 2) tabulated surrogate recoveries and QC limits from Methods 3500 and 8000 in SW-846 and all validation and sample raw data;
- 3) tabulated matrix spike/matrix spike duplicate recoveries, relative percent differences, spike concentrations, and QC limits from Methods 3500 and 8000 in SW-846 and all validation and sample raw data;
- 4) associated blanks (trip, equipment, and method with accompanying raw data for tests);
- 5) the chain of custody for the sample shipment groups, and
- 6) a narrative summary of method and any problems encountered during extraction or analysis.

In addition to raw data for all samples and blanks, the laboratory will be responsible for retaining the following information for review by EPA for data validation purposes:

- 1) tabulated initial and continuing calibration results (concentrations, calibration factors or relative response factors and mean relative response factors, % differences and % relative standard deviations) with accompanying raw data;
- 2) tabulated retention time windows for each column;
- 3) a record of the daily analytical scheme (run logbook, instrument logbook) which includes samples and standards order of analysis;
- 4) the chain of custody for the sample shipment groups;
- 5) example calculation for positive values and detection limits; and
- 6) tabulated sample weights, volumes, and % solids used in each sample calculation.

The forms utilized to report the data will be identified in the laboratory QAPP.

## **2.2 FIELD SAMPLING PLAN (“FSP”)**

The objective of the Field Sampling Plan is to provide EPA and all Work Settling Defendants involved with the collection and use of field data with a common written understanding of all field work. The FSPs will be presented in the individual PDI and RD/RA Work Plans and should be written so that a field sampling team unfamiliar with the Site would be able to gather the samples and field information required. Guidance for the selection of field methods, sampling procedures, and custody can be acquired from the Compendium of Superfund Field

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Operations Methods (OSWER Directive 9355.0-14, EPA/540/P-87/001), December 1987, which is a compilation of demonstrated field techniques that have been used during remedial response activities at hazardous waste sites. The FSP shall be site- and activity-specific and shall include the following elements:

1. Site Background. If the analysis of the existing Site details is not included in the Work Plan or in the QAPP, it must be included in the FSP. This analysis shall include a description of the Site and surrounding areas and a discussion of known and suspected contaminant sources, probable transport pathways, and other information about the Site. The analysis shall also include descriptions of specific data gaps and ways in which sampling is designed to fill those gaps.
2. Sampling Objectives. Specific objectives of sampling effort that describe the intended uses of data must be clearly and succinctly stated.
3. Sampling Location and Frequency. This section of the FSP identifies each matrix to be collected and the constituents to be analyzed. Tables shall be used to clearly identify the numbers of samples, the types of sample (water, soil, etc.), and the number of quality control samples (duplicates, trip blanks, equipment blanks, etc.). Figures shall be included to show the locations of existing or proposed sample points.
4. Sample Designation. A sample numbering system shall be established for the project. The sample designation should include the sample or well number, the sample round, the sample matrix (e.g., surface soil, ground water, soil boring), and the name of the Site.
5. Sampling Equipment and Procedures. Sampling procedures must be clearly written. Step-by-step instructions for each type of sampling that are necessary to enable the field team to gather data that will meet the Data Quality Objectives ("DQOs"). A list should include the equipment to be used and the material composition (e.g., Teflon, stainless steel) of equipment along with decontamination procedures.
6. Sampling Handling and Analysis. A table shall be included that identifies sample preservation methods, types of sampling jars, shipping requirements, and holding times. Examples of paperwork such as chain-of-custody forms and sample tags to be filled out for each sample, as well as instructions for filling out the paperwork, must be included. Field documentation methods including field notebooks and photographs shall be described.

Each Field Sampling Plan for the PDI and RD/RA activities shall be sufficiently detailed to carry out the study, and shall provide data needed to address the objective of the study and to complete the study. Each study shall be designed to achieve a high performance on the first attempt. Each work plan shall be related (by cross-references) to the other requirements in the Project Operations Plan.

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### **3. HEALTH AND SAFETY PLAN (“HASP”)**

The objective of the Site-specific Health and Safety Plan is to establish the procedures, personnel responsibilities and training necessary to protect the health and safety of all on-site personnel during the PDIs and RD/RA. The plan shall provide for routine but hazardous field activities and for unexpected Site emergencies.

The Site-specific health and safety requirements and procedures in the HASP shall be updated based on an ongoing assessment of Site conditions, including the most current information on each medium. For each field task during the PDIs and RD/RA, the HASP shall identify:

1. possible problems and hazards and their solutions;
2. environmental surveillance measures;
3. specifications for protective clothing;
4. the appropriate level of respiratory protection;
5. the rationale for selecting that level; and
6. criteria, procedures, and mechanisms for upgrading the level of protection and for suspending activity, if necessary.

The HASP shall also include the delineation of exclusion areas on a map and in the field. The HASP shall describe the on-site person responsible for implementing the HASP for the Work Settling Defendants representatives at the Site, protective equipment personnel decontamination procedures, and medical surveillance. The following documents shall be consulted:

1. Interim Standard Operations Safety Guides (Hazardous Response Support Division, Office of Emergency and Remedial Response, EPA, Wash. D.C., 1982);
2. Superfund Public Health Evaluation Manual (OSWER Directive 9285.41, EPA/540/1-861060, EPA, 1986);
3. Hazardous Waste Operations and Emergency Response Standard (Department of Labor, Occupational Safety and Health Administration (“OSHA”), 29 C.F.R. Part 1910.120); and
4. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities: Appendix B (NIOSH/OSHA/EPA 1986).

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OSHA regulations at 40 C.F.R. 1910 and Chapter 9 of the Interim Standard Operating Safety Guide, which describes the routine emergency provisions of a site-specific health and safety plan, shall be the primary reference used by the Work Settling Defendants in developing and implementing the Health and Safety Plan.

The measures in the HASP shall be developed and implemented to ensure compliance with all applicable state and Federal occupational health and safety regulations. The HASP shall be updated at the request of EPA during the course of the RD/RA and as necessary.